



**NEW<sup>TIME</sup> –  
TECHNOLOGY**



**SpetsTechnoExport  
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**AVIATION**





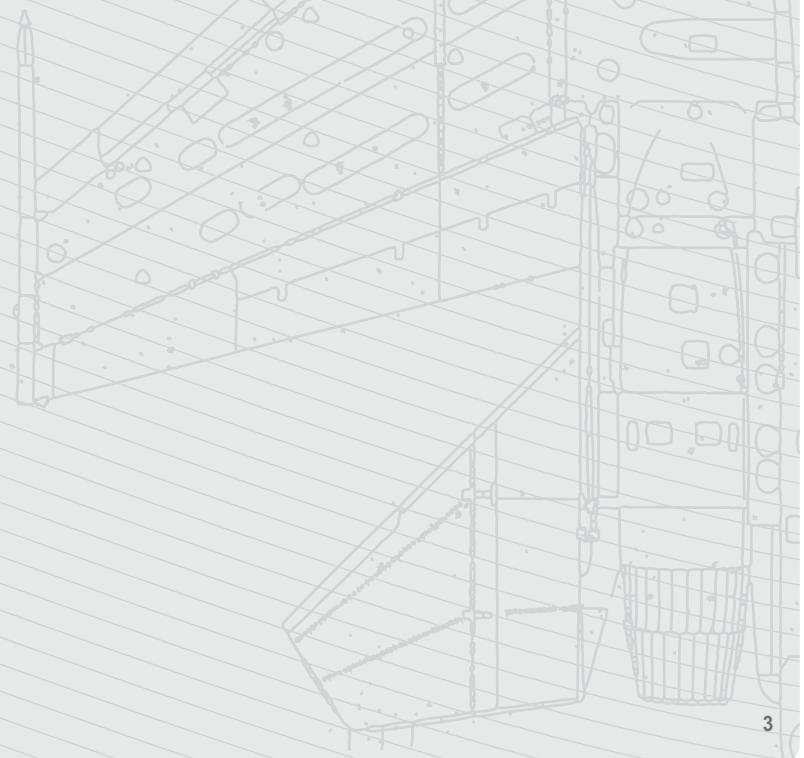
## Ladies and Gentlemen,

State Foreign Trade Enterprise «SpetsTechnoExport» specializes in export of up-to-date military technologies and rendering services on repair, modernization and maintenance of weapons and special-purpose equipment.

We are proud to remind you that Ukraine is one of few countries in the world that has great technological knowledge in aerospace industry and possesses full technological circle of aircraft manufacture.

Our Enterprise offers a wide range of products and services of Ukrainian aircraft industry original equipment manufacturers (OEMs). These products are intended for ex-USSR aircraft families as well as for brand new aircraft produced in Ukraine and abroad. We have best practices and experience in arrangement of overhaul, life extension and modernization of ex-USSR aircraft as well.

Being conscious that fruitful cooperation at highly competitive aerospace market is a mutual interest of the Customers and Suppliers, we are proud to propose services of Ukrainian design bureaus and OEMs to fulfill all Customer's requirements.





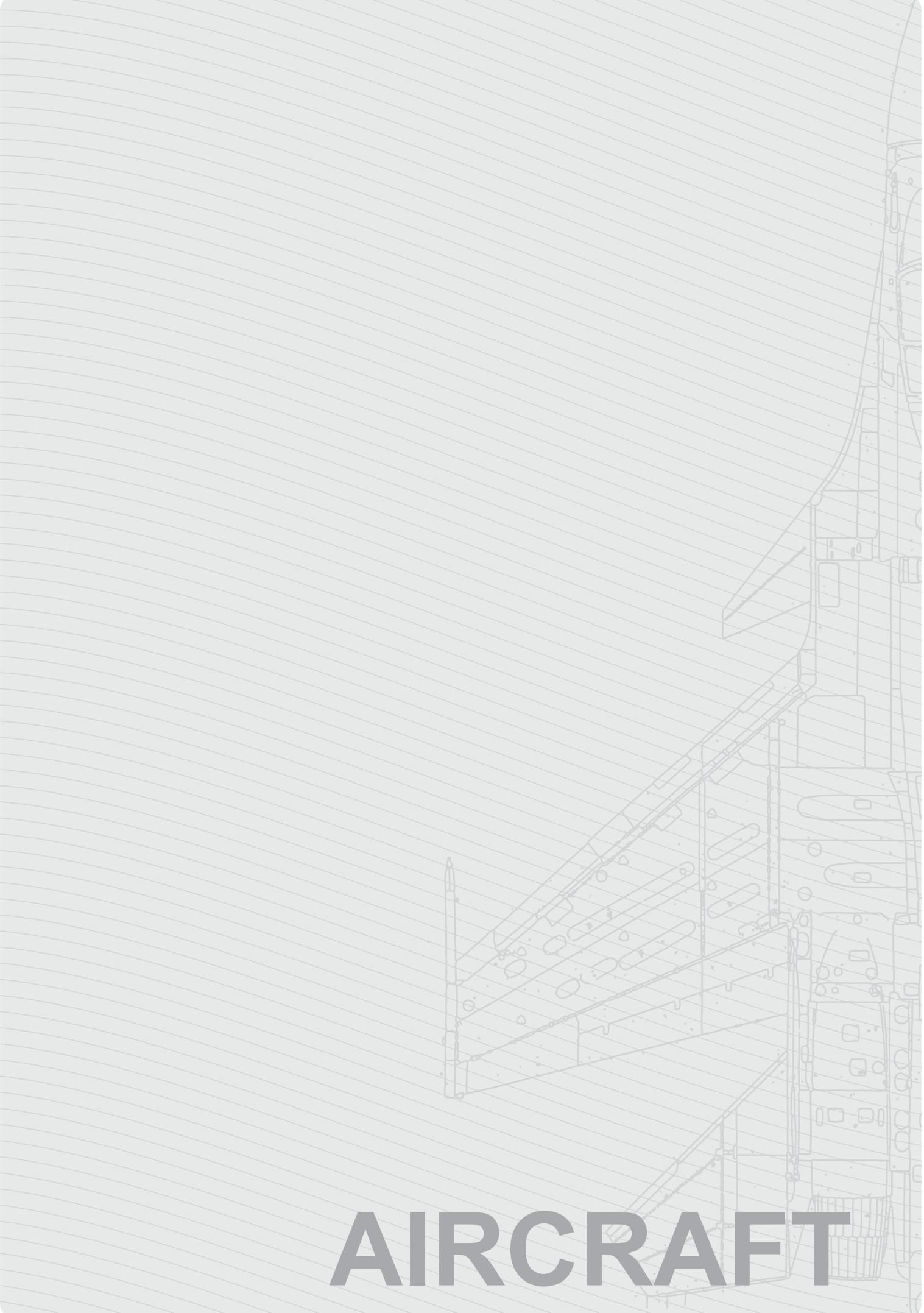


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NEW TIME  
TECHNOLOGY



AIRCRAFT

A large, bold, sans-serif font word centered on the page. The background features a detailed wireframe technical drawing of an aircraft's front section, showing the cockpit, windows, and structural framework.



# AIRCRAFT

## An-32P Firefighting aircraft

An-32P is designed for firefighting by means of discharging fire extinguishing liquids, transportation to fire points and target para-drop of firemen and special equipment, transportation of firefighting resources to the areas on fire. When not firefighting, aircraft can be converted into transport aircraft within airfield facilities.



### Operational features:

Discharge of 8 tons of fire extinguishing liquid from two tanks at 40-50 m above ground and speed of 240 to 260 km/h will result to creation of water spot with liquid concentration more than 1 l/sq. m, 120-160 m long and 10-35 m wide. Fire extinguishing liquid can be discharged simultaneously (in a volley) or one after the other from two modules of each tank with automatic delay.

Cargo compartment size (length 12,48 m, width 2,78 m and height 1,84 m) and tail hatch size ensure transportation of cargo, motor wheeled and non-motor wheeled equipment. Cargo compartment is airtight and fitted with air conditioning system. For transport operations aircraft is fitted with big cargo hatch in fuselage tail part with frame as a door, which can be lowered to ground and serve as loading ramp or be shifted under the fuselage, thus providing expedient loading of cargos into the aircraft directly from the truck as well as easy para-drop of troops or cargos. Loading lift with 3 tons lifting capacity, detachable roller facility which ensures para-drop of platforms and transportation of cargos on pallets are also fitted. An-32P is designed for firefighting by means of discharging fire extinguishing liquids, transportation to fire points and target para-drop of firemen and special equipment, transportation of firefighting resources to the areas on fire. When not firefighting, aircraft can be converted into transport aircraft within airfield facilities.

### An-32P performance

Maximum weight of fire extinguishing liquid (kg)	8000
Flight envelope with fully loaded tanks and en-route fuel reserve for 30 min (km)	330
Minimum speed of flight while discharging fluid (km/h)	220–240
Total volume of discharged liquid for an hour of work in flight envelope (ton):	
- 15 km	8
- 150 km	16
- 300 km	32
Ferry range (km)	1700
Cruising speed (km/h)	500
Required length of runaway (MCA, H=0) (m)	1950
<b>Engines:</b>	
Type	AI-20Д ser. 5
Quantity x power (kW)	2 x 3800
Firemen with special equipment (persons)	27-30
Crew (persons)	3

### Production: An-32P is manufactured by Antonov ASTC

In 1995 An-32P aircraft received type certificates of special category issued by Aviation Register of Interstate Aviation Committee and State Aviation Administration of Ukraine.



# AIRCRAFT

## An-124-100/An-124-100M-150 "Ruslan" Long-range heavy transport aircrafts



An-124-100 aircraft is designed for transportation of various cargos with 120 tons payload (An-124-100M-150 – 150 tons payload). Unique transport capacity and high performance of aircraft were acknowledged in commercial operation, which created new market segment, id est bulky and superheavy cargos.

### Operational features:

Aircraft fuselage has a double-deck layout. Crew cabin, relief crew compartment and passenger cabin for cargo attendants are situated on the upper deck.

Lower deck is airtight cargo compartment. Construction and size of front and rear cargo hatches with ramps ensure fast and efficient fulfillment of loading and unloading operations. On-board system of cargo handling equipment allows skipping ground facilities for all loading and unloading operations. Multistrat cross-surface landing gear, two APU and cargo-handling equipment ensure autonomous operation of aircraft on unprepared airfields. Simplicity, reliability and safety operation of aircraft are enhanced by system backup and their computer automation.

### An-124-100M-150 performance

Maximum payload (ton)	150
Flight range (km):	
- with cargo of 150 tons	3200
- with cargo of 120 tons	5200
- with cargo of 40 tons	11900
- without cargo	14400
Cruising speed (km/h)	800–850
Flight altitude (m)	8800–11600
<b>Engines:</b>	
Type	ТРДД Д18Т, III range
Quantity x thrust (ton-force)	4 x 23,4
Length of runaway (m)	3000
Cargo compartment size (m)	
Length of floor (with frames)	36,5 (43,7)
Floor width	6,4
Height	4,4
Cargo compartment volume (m <sup>3</sup> )	1160
Crew (persons)	4

In 1992 Antonov ASTC got type certificate for aircraft An-124-100, issued by Aviation Register of Interstate Aviation Committee (hereinafter referred to as AR IAC).

In 2007 AR IAC issued Supplement to type certificate for modification An-124-100M-150.

### Production:

In 2003 manufacture was terminated after the production of 56 aircrafts. Renewal of manufacture of modernized aircrafts of An-124 family is in process.



# AIRCRAFT

## An-70 Short take-off and landing military cargo aircraft

An-70 is medium-range short take-off and landing military cargo aircraft ensures transportation of nearly whole nomenclature of airmobile machinery and armament with gross weight of 35-47 tones, paratrooping of up to 110 soldiers and equipment including single cargos up to 21 tones weight, air landing of 300 soldiers with individual weapon and evacuation of 206 injured or sick personnel.

### Operational features:

Depending on operation mode and take-off weight, An-70 is able to operate from 1550-1800 meters long concrete runways with medium surface strength, as well as from 600-700 meters long unpaved airfields with low surface strength. An-70 provides transportation of 20 tones of cargo for distance of

3000 km in short take-off and landing mode, being operated from 600-700 meters long unpaved runway.

Four engines D-27 with coaxial rotor propellers SV-27 ensure high cruise speed while allowing 20-30% fuel saving in comparison with modern turbojet aircrafts. Digital integrated system of on-board equipment ensures the exploitation of aircraft in all latitudes at any time of day or night, normal and adverse weather operation, flights above no reference marks area, protection from air defence means, formation flights, take-off and landing on unprepared unpaved airfields. Built-in aerial-delivery system ensures the independence of loading and unloading of wide nomenclature cargos and their air dropping.



### An-70 performance

Maximum payload capacity (tones)	47	
Airfield conditions	Usual take-off/landing	Short take-off/landing
	Concrete	Unpaved
<b>Required airfield length (meters)</b>		
	1550-1800	600-700
<b>Practical range (km)</b>		
- with cargo of 47 tones	3000	
- with cargo of 35 tones	5100	
- with cargo of 20 tones	6600	3000
- without cargo	8000	6700
Cruising speed (km/hr)	700-750	
Cruising level (meters)	9000-12000	
<b>Engines:</b>		
Type	Turboprop-fan engine D-27	
Quantity x power (kW)	4 x 10300	
Crew (persons)	3-5	

Two aircrafts are in production at the moment upon the order of Ministry of Defence of Ukraine.





# AIRCRAFT

## An-74T Transport aircraft



Aircrafts of An-74T family are designed for machinery and cargo transportation, including containers and pallets, with maximum payload 10 tons.

### Operational features:

An-74T was constructed on the basis of An-72 aircraft (military transport short take-off and landing aircraft). It can operate regularly at unprepared airfields with unreliable runway surface in continuous autonomous mode. Built-in systems of modern flight and navigation and radio communication equipment

allow the operation of flights at both prepared airways and off-the-airway routes.

Highly mechanized wing and perfect stability and maneuverability make it possible to operate flights with high-angle trajectory take-off and landing. Airtight crew cabin and air-conditioning system ensure proper conditions for transportation of troops and perishable food. Cargo compartment size, tail hatch with lift frame and built-in loading facilities ensure autonomous loading and unloading of various cargos, as well as para-dropping them if necessary.

### An-74T performance

Maximum payload (ton)	10
<b>Cargo compartment size (m)</b>	
- floor length	10,5
- floor width	2,15
- height	2,2
Cargo compartment volume (m <sup>3</sup> )	50
Required runaway length (m)	1100
<b>Flight range (km):</b>	
- with cargo of 10 tons	1350
- with cargo of 8,5 tons	2000
- with cargo of 7,5 tons	2300
- with cargo of 6 tons	3000
Cruising speed (km/h)	600–700
Cruising altitude (m)	10100
<b>Engines:</b>	
Type	ТРДД Д-36 ser. 3А
Quantity x thrust (ton-force)	2 x 6,5
Crew (persons)	2

**Production:** An-74T family Aircraft is manufactured by Kharkiv State Aircraft Manufacture Enterprise.



## AIRCRAFT

### An-74MP Marine patrol aircraft



An-74MP marine patrol aircraft is designed for operations involving marine patrolling, search and rescue operations, disclosure water surface contamination, control over fishery rules observation, as well as transport operations.

Aircraft is equipped with navigation target acquisition system and flight system which provide automatic air navigation at all stages of flight, positioning, search and localization of surface ships,

determination of their speed and routing; fixed photographic equipment which ensures target air surveying; radio equipment for communication with downlink points and with other aircrafts, radio guidance to discovered cutters or other ships; armament for preclusion of movement of intruder ships; television system of surveillance of underlying terrain which ensures operation in day and night conditions.

#### An-74MP performance

Maximum payload (ton)	10
Cruising speed (km/h)	600–700
Patrol speed (km/h)	280
Operating ceiling (m)	10100–11000
Flying range (km)	Up to 4000
Crew (persons)	5–7

**Production:** An-74T family Aircraft is manufactured by Kharkiv State Aircraft Manufacture Enterprise.



## AIRCRAFT

### An-38 Light multipurpose aircraft

An-38 light multipurpose aircraft is designed for local air transportation of passengers (up to 27), mail and cargos (weight up to 2500 kg). Aircraft is equipped with hand-held overhead-track hoist with 500 kg load capacity for the facilitation of loading and unloading. Great take-off and landing performance along with low-pressure tyre gear ensure the operation of An-38 on small runaways, including unpaved, ice or snow covered ones.

An-38-100 is able to operate night flights, as well as adverse weather flights, owing to the modern system of navigation equipment and meteorological radar. Aircraft can also be operated in wide temperature range from -50°C to +45°C. Passenger cabin can be converted into cargo or cargo-passenger compartment

by the crew within any intermediate airfield facilities.

An-38-100 and An-38-120 aircrafts are equipped with engines TPE 331-14CP-801E manufactured by Honeywell company. An-38-100 can be equipped with avionics of other foreign companies or avionics produced in CIS.

In April 1997 Antonov ASTC received certificate of type for An-38-100 aircraft of transport category according to the certification base, elaborated with regard to the Aviation Rules, Part 25 (AR-25). In March 2001 Antonov ASTC got certificate of type supplement No1, allowing international flights.

Aircraft proved its high performance in the course of exploitation by Malaysian, Vietnamese and Russian airlines.





# AIRCRAFT

## An-140 Regional turboprop aircraft family

Aircrafts of An-140 family are designed for passenger and passenger-cargo transportation. Baseline aircraft is envisaged for transportation of 52 passengers.

### Operational features:

An-140 family are high wing monoplane aircrafts with two turbo propelled engines TB3-117BMA-CBM1 mounted on wing. The volumes of baggage-cargo compartments of An-140 passenger aircrafts exceed by 1,3-1,5 times those of other aircrafts of the same rating. The front part of passenger cabin can be converted into cargo transporting facility for pallet transportation. Due to this the loading door is

arranged on right board of fuselage, at the same time floor is improved and equipped with relevant detachable accessories. Aircraft is capable to operate from unpaved, peas, iced and snow covered runways owing to its cross-surface chassis with low-pressure tyres and high mounted engines, which excludes damage of propellers and engine air intakes by extraneous objects during take-off and landing.

In 2000 An-140 and its modified model An-140-100 got type certificates issued by Aviation Register of Interstate Aviation Committee and State Aviation Administration of Ukraine. At present air operators of Ukraine, Russia and Iran exploit An-140 aircrafts.



### An-140-100 performance

Maximum payload (ton)	6
<b>Flight range (km):</b>	
- with maximum payload	1400
- with 52 passengers	2400
- with maximum fuel load (43 passenger)	3050
Cruising speed of flight (km/h)	Up to 540
Flight altitude (m)	7600
<b>Engines:</b>	
Type	ТВД ТВ3-117ВМА-СБМ1
Quantity x power (hp)	2 x 1838 (2500)
Airfield length (m)	1500–1800
Baggage-cargo compartment volume (m <sup>3</sup> )	9,1
Crew (persons)	2

**Production:** An-140 is manufactured by Kharkiv State Aircraft Manufacture Enterprise (Ukraine), CJSC "Aviacor – Samara Aircraft Plant" (Russian Federation) and HESA plant (Esfahan, Iran).



# AIRCRAFT

## An-148 Regional jet aircraft of new generation



An-148 is designed to transport 68-85 passengers on regional and short-haul lines for the distance up to 2100 km (An-148-100A), up to 3500 km (An-148-100B) and up to 4400 km (An-148-100E).

### **Operational features:**

An-148 is a high-wing monoplane aircraft with engines Д-436-148 mounted on the pylons under the wing. This arrangement enhances protection of engines and wing structure against damage caused by extraneous objects. Built-in auxiliary power unit, built-in maintenance recorder, as well as high level of

exploitability and system reliability allow An-148-100 to operate at unprepared airfields.

Passenger cabin comfort is relevant to the comfort of long-haul aircrafts.

Modern flight and navigation and radio communication equipment, multifunctional displays and fly-by-wire system ensure the operation of An-148 on any lines, in normal and adverse weather, day and night, including high density air routes, with high level of comfort for crew.

In 2007 An-148 got type certificates issued by Aviation Register of Interstate Aviation Committee and State Aviation Administration of Ukraine.

### **An-148-100B performance**

Maximum payload (ton)	9
<b>Flight range (km):</b>	
- with 75 passengers	3500
Cruising speed (km/h)	Up to 870
Cruising altitude (m)	12 200
<b>Engines:</b>	
Type	ТРДД Д-436-148
Quantity x thrust (ton-force)	2 x 6,83
Runaway length (m)	1800
Baggage-cargo compartment volume (m <sup>3</sup> )	16
Crew (persons)	2



## AIRCRAFT

### An-158 Regional jet aircraft

An-158 is the result of further development of An-148 regional jet aircraft. It is designed for transportation of 86 passengers in two-class arrangement of seating for the distance up to 3100 km, 99 passengers in one-class

arrangement of seating for the distance up to 2500 km. High level of An-158 and An-148 unification guarantees the reduction of aircraft price, tuition expenses, technical maintenance and repair expenses.



### An-168 Antonov Business Jet Aircraft

An-168 aircraft is derived from An-148 regional jet aircraft. Various modifications of An-168 are able to transport 8 to 40 passengers in high comfort conditions for distance up to 7000 km. VIP-persons will have at their disposal everything necessary for work during the

flight, as well as for proper rest. Advantage of Antonov Business Jet is its ability to operate not only international, but also inner flights to any national airport, owing to high engine location on the wing and to stairs fitted in entrance.





## AIRCRAFT

## An-225 "Mriya"



Ukrainian pride – the unique cargo Aircraft An-225 "Mriya".

An-225 is the world's heaviest airlift cargo aircraft ever. It can carry ultra-heavy and oversize freight, up to 253,000 kg.

The Aircraft set up a number of world records including the heaviest commercial cargo transportation, the heaviest single cargo item transportation, the heaviest take-off weight and many others.



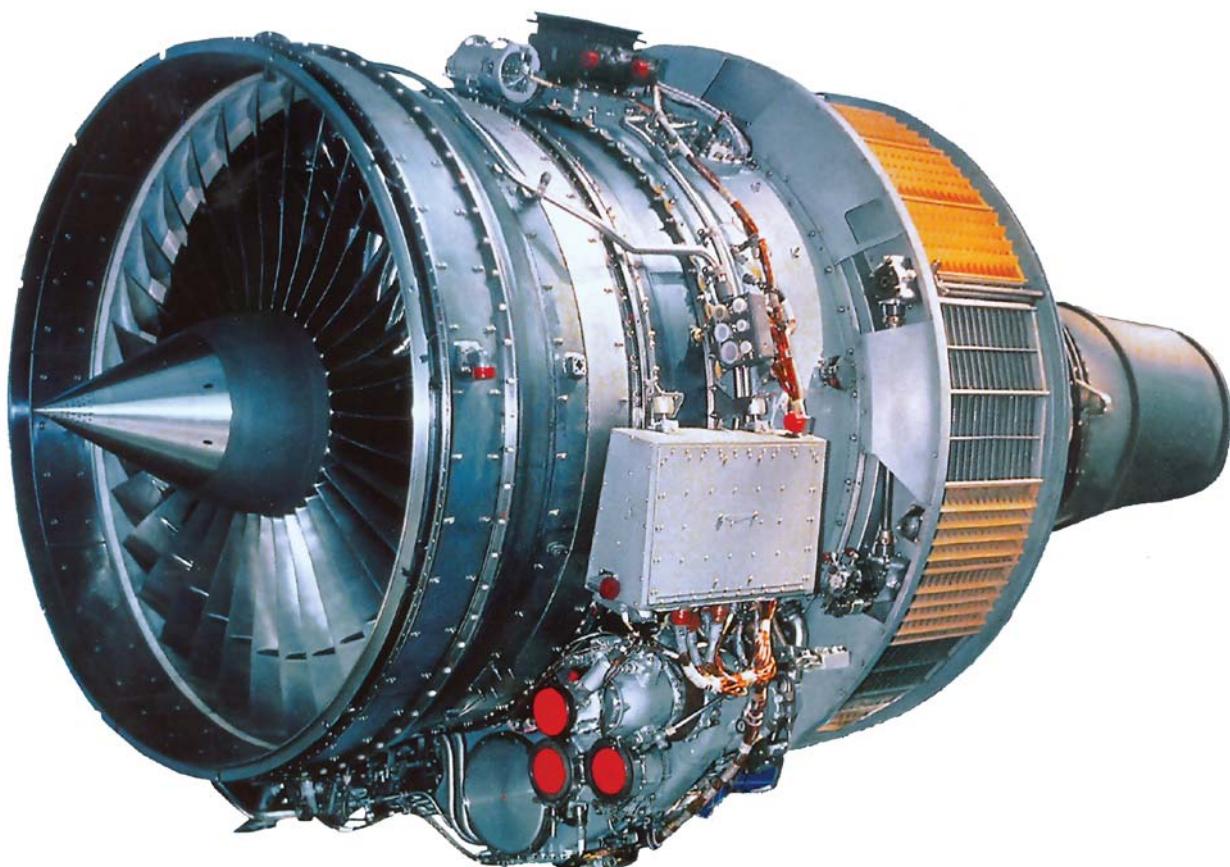
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# ENGINES



## ENGINES

### D-436T1/T2 TURBOFAN ENGINE



The D-436T1/T2 engine is intended to power short-haul and medium-haul airliners Tu-334-100, Tu-334-200, Tu-230 and other highly efficient passenger and cargo aircraft.

The engine complies with both effective and future ICAO requirements for aircraft engine noise and emission performances.

#### Main advantages of the engine:

- Low specific fuel consumption and low weight-to-

- thrust ratio;

- High reliability due to long experience in operating the D-36 engine of similar class;
- Low levels of emission and noise;
- Easy maintenance and high affectivity of monitoring and diagnostic system;
- Universal mount for installing the engine on various airplanes in underwing or overwing, fuselage or side positions without changing the engine design;
- Low operating costs at long service life.

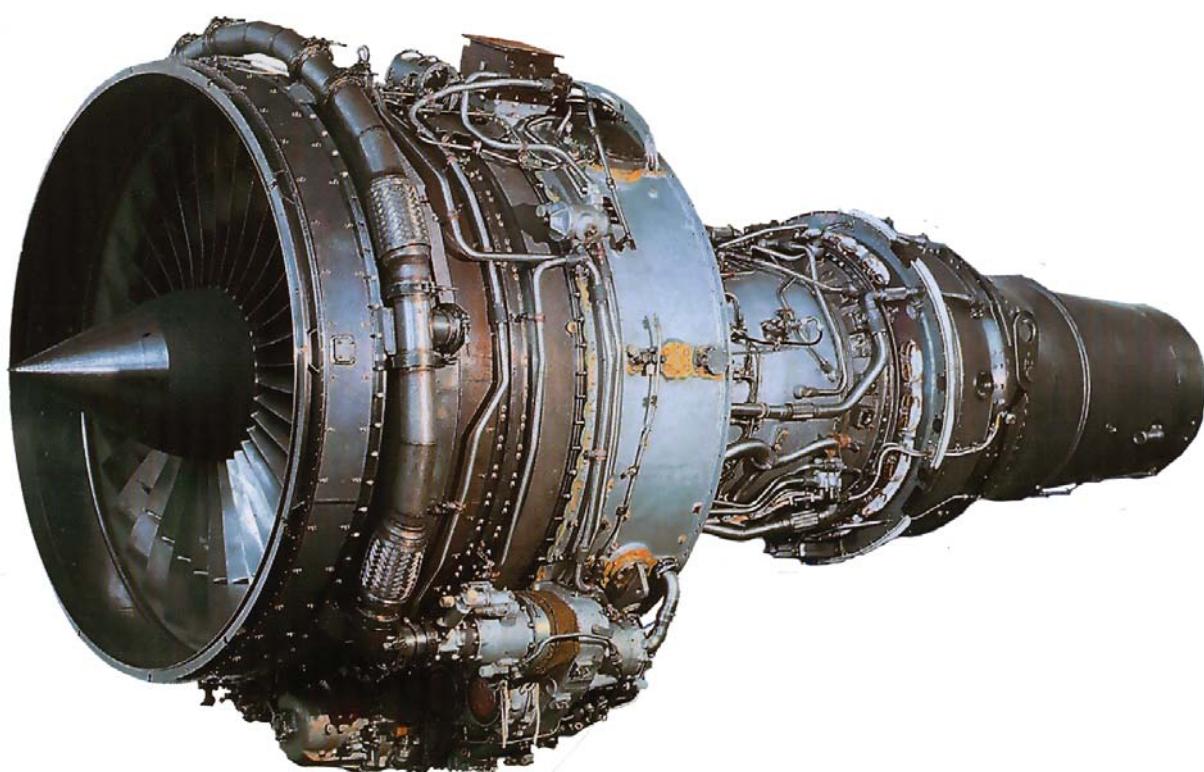
#### BASIC SPECIFICATIONS

	D-436T1	D-436T2
Takeoff power (SLS, ISA +15 °C, PAMB=730 mm Hg):		
Thrust, kgf (kN)	7500 (73.57)	8200 (80.44)
Cruising altitude (m)	12 200	
Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.370 (37.7)	0.376 (38.3)
Maximum cruise power ( $i = 11000$ m, $M_{fl} = 0.75$ , ISA):		
Thrust, kgf (kN)	1500 (14.71)	1600 (15.70)
Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.608 (61.9)	0.617 (62.9)
Dry weight, kg	1450	1450



## ENGINES

### D-436TP TURBOFAN ENGINE



It is designed to power the Be-200 multipurpose amphibian.

The engine complies with both effective and future ICAO requirements for aircraft engine noise and emission parameters.

#### **The major advantages of the D-436TP engine:**

- low SFC and low weight-to-thrust ratio;
- high reliability due to long experience in operating the D-36 engine of similar class;
- low noise and emissions;

- easy maintenance, high efficiency of the monitoring and diagnostics system;
- steady operation in event of sudden airflow temperature inversions at engine inlet when fighting forest fires;
- availability of multi-purpose engine mounts allowing for installation in various aircraft on underwing or overwing pylons, in fuselage or on either side of the fuselage without any changes in the engine design;
- operability in maritime conditions;
- low operating costs and long service life.

#### **BASIC SPECIFICATIONS**

Takeoff power (SLS, ISA+15°C, PAMB=730 mm Hg):

Thrust, kgf (kN)	7500 (73.57)
------------------	--------------

Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.370 (37.7)
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Maximum cruise power (H=11000 m, Mfl=0.75, ISA):

Thrust, kgf (kN)	1500 (14.71)
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Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.608 (61.9)
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Dry weight, kg	1450
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# ENGINES

## D-436-148 TURBOFAN ENGINE

It is intended for installation in An-148 aircraft used by regional and short-haul routs.

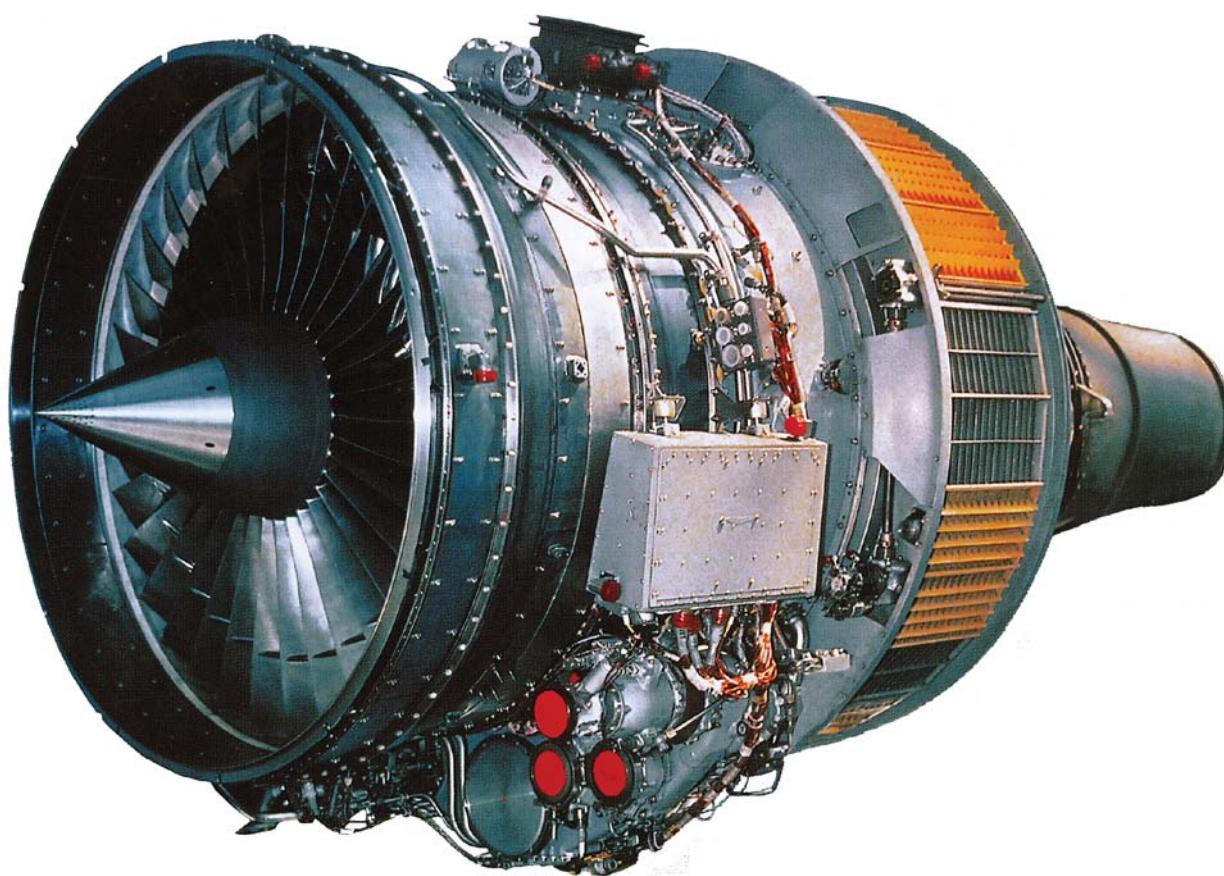
It is actually the further modification of D-436T1 engines installed in Tu-334 plane.

The engine complies with both effective and future ICAO requirements for aircraft engine noise and emission performances.

### Main advantages of the engine:

- low specific fuel consumption and low weight-to-thrust ratio;

- high reliability due to long experience in operating the D-36 engine of similar class;
- low levels of emission and noise;
- easy maintenance and high effectiveness of monitoring and diagnostic system;
- universal mount for installing the engine on various airplanes in underwing or overwing, fuselage or side positions without changing the engine design;
- low operating costs at long service life



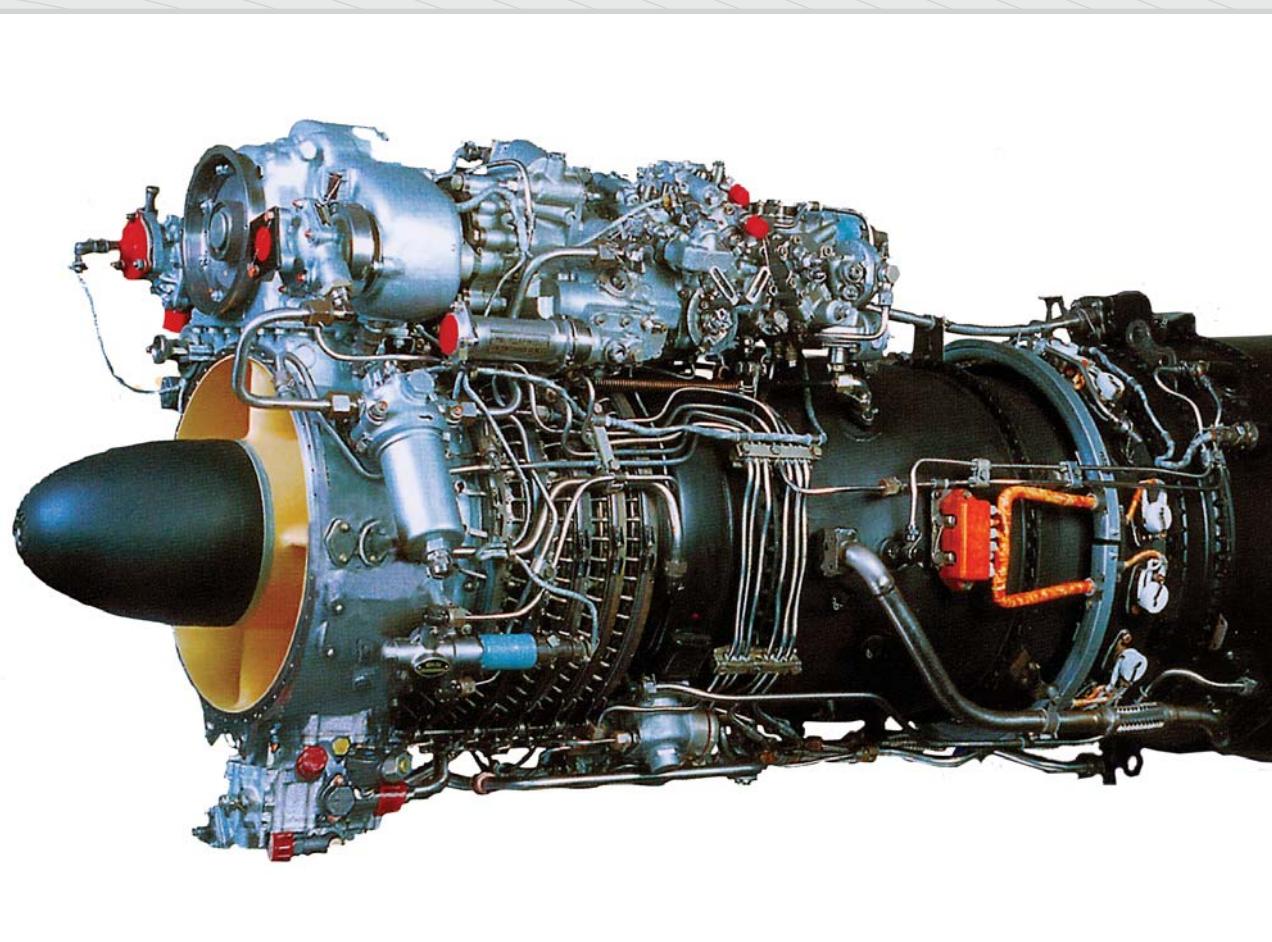
### SPECIFICATIONS

ACS setting variant	short-range aircraft	long-range aircraft
Takeoff rating (PAMB=760 mm Hg, MFL=0)	(tAMB +37.5°Ñ)	(tAMB +30°Ñ)
Thrust, kgf (kN)	6400 (62784)	6830 (67002)
Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.36 (0,0366)	0.36 (0,0366)
Maximum cruise rating ( $\bar{l}$ =11000 m, $\bar{l}_{FL}=0.75$ , ISA +10°Ñ):		
Thrust, kgf (kN)	1500 (14715)	1500 (14715)
Specific fuel consumption, kg/kgf(N)h	0.608 (61.9)	0.617 (62.9)
Max.dry weight, kg	1400	1400



## ENGINES

### VK-2500 TURBOSHAFT ENGINE



This engine is used to power the Mi-28N and Ka-52 helicopters as well as upgrading the Mi-14, Mi-17, Mi-24, Mi-28, Ka-32, Ka-50 and Ka-50-2 helicopters.

The turboshaft is a higher-power upgraded version of widely known TV3-117VMA turboshaft. It is one of the world's best turboshafts as regards its fuel efficiency and weight performances.

Profound experience in mass-producing and operating the base engine along with applying an up-to-date control system have enabled to raise operating performances and ensure high dependability and extensive service life.

#### MAIN ADVANTAGES OF THE ENGINE:

- low specific fuel consumption;
- low weight-to-power ratio;
- high reliability;
- long service life;
- high maintainability;
- high reparability;
- steady operation in harsh dust and smoke conditions;
- possibility of long-lasting maritime operation;
- sustaining constant power at high ambient temperatures in the mountainous terrain

#### SPECIFICATIONS

Emergency power condition (SLS, ISA +15°C):

Power, shp (kW)	2700 (1985)
-----------------	-------------

Takeoff power condition (SLS, ISA +15°C):

Power, shp (kW)	2400 (1764)
-----------------	-------------

Specific fuel consumption, kg/hp·h (kg/kW· h)

0.210 (0.286)
---------------

Cruise power condition (SLS, ISA +150C):

Power, shp (kW)	1750 (1287)
-----------------	-------------

Specific fuel consumption, kg/hp·h (kg/kW·h)

0.225 (0.313)
---------------

Dry weight, kg

295
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## ENGINES

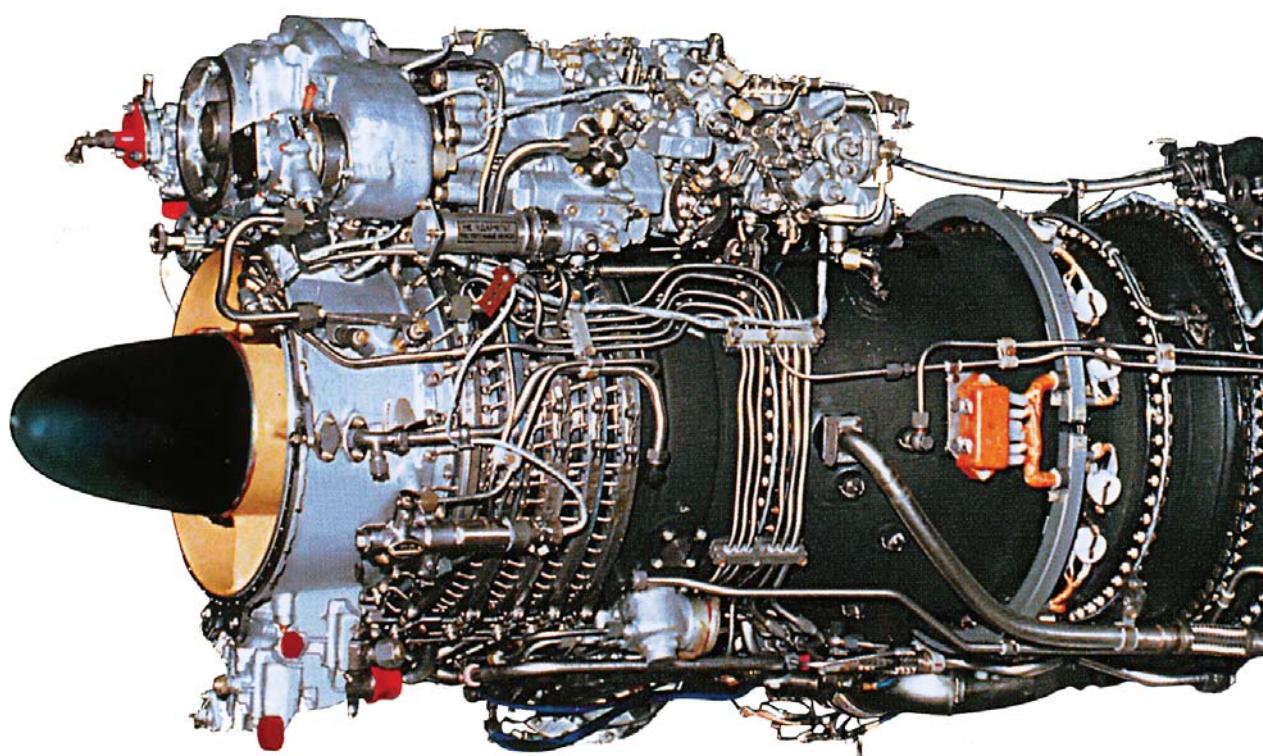
### TV3-117VM TURBOSHAFT ENGINE

The TV3-117VM turboshaft engine is used to power the Mi-14, Mi-17, Mi-8AMT, Mi-8MT, 80MT, Mi-28, Mi-171, Mi-172, and Mi-8MTV as well as other passenger and cargo helicopters.

The TV3-117VM turboshaft is one of the world's best engines as regards its fuel efficiency and weight performances. High-tech development and perfect mass-production process have ensured the engine's superior reliability and extensive service life.

#### Main advantages of the engine:

- low specific fuel consumption;
- low weight-to-power ratio;
- high reliability;
- long service life;
- high maintainability;
- high repairability;
- emergency power condition allowing to complete a flight with one engine inoperative;
- possibility for installing a dust protection device



#### BASIC SPECIFICATIONS

	TV3-117VM	TV3-117VM Series 02
Emergency power condition (SLS, ISA):		
Power, shp (kW)	2200 (1618)	2200 (1618)
Takeoff power condition (SLS, ISA):		
Power, shp (kW)	2000 (1471)	2000 (1471)
Specific fuel consumption, kg/hp·h (kg/kW·h)	0.215 (0.296)	0.210 (0.286)
Cruise power condition (SLS, ISA):		
Power, shp (kW)	1500 (1103)	1500 (1103)
Dry weight, kg	294	294



## ENGINES

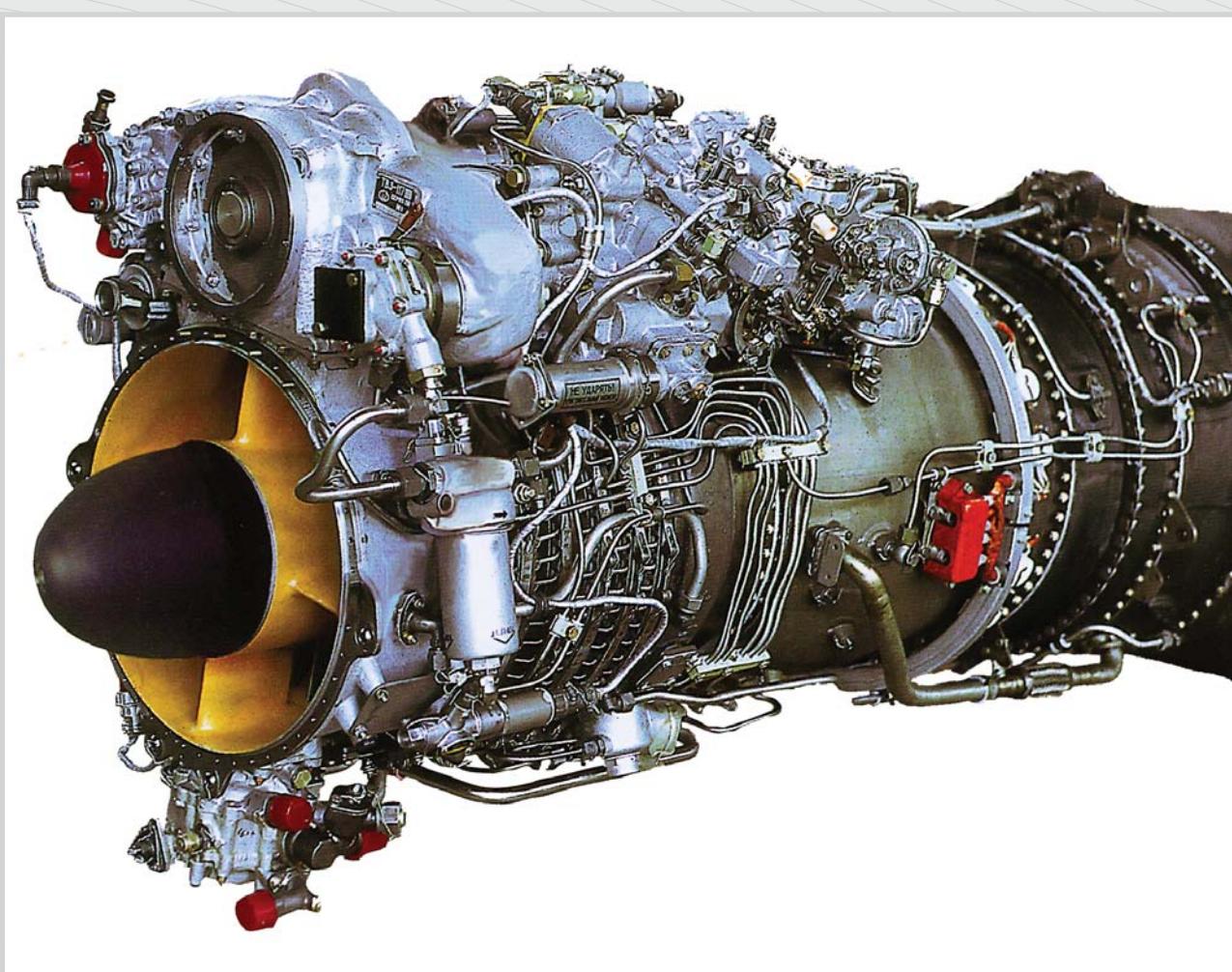
### TV3-117MA TURBOSHAFT ENGINE

The TV3-117VMA turboshaft engine is used to power the Ka-27, Ka-29, Ka-32, Ka-50, Ka-52, Mi-24, Mi-28, D-2, D-2B, and other helicopters.

The TV3-117VMA turboshaft is one of the world's best engines as regards its fuel efficiency and weight performances. High-tech development and perfect mass-production process have ensured the engine's superior reliability and extensive service life.

#### Main advantages of the engine:

- low specific fuel consumption;
- low weight-to-power ratio;
- high reliability;
- long service life;
- high maintainability;
- high reparability;
- steady operation in harsh dust and smoke conditions;
- possibility of long-time operation in maritime conditions



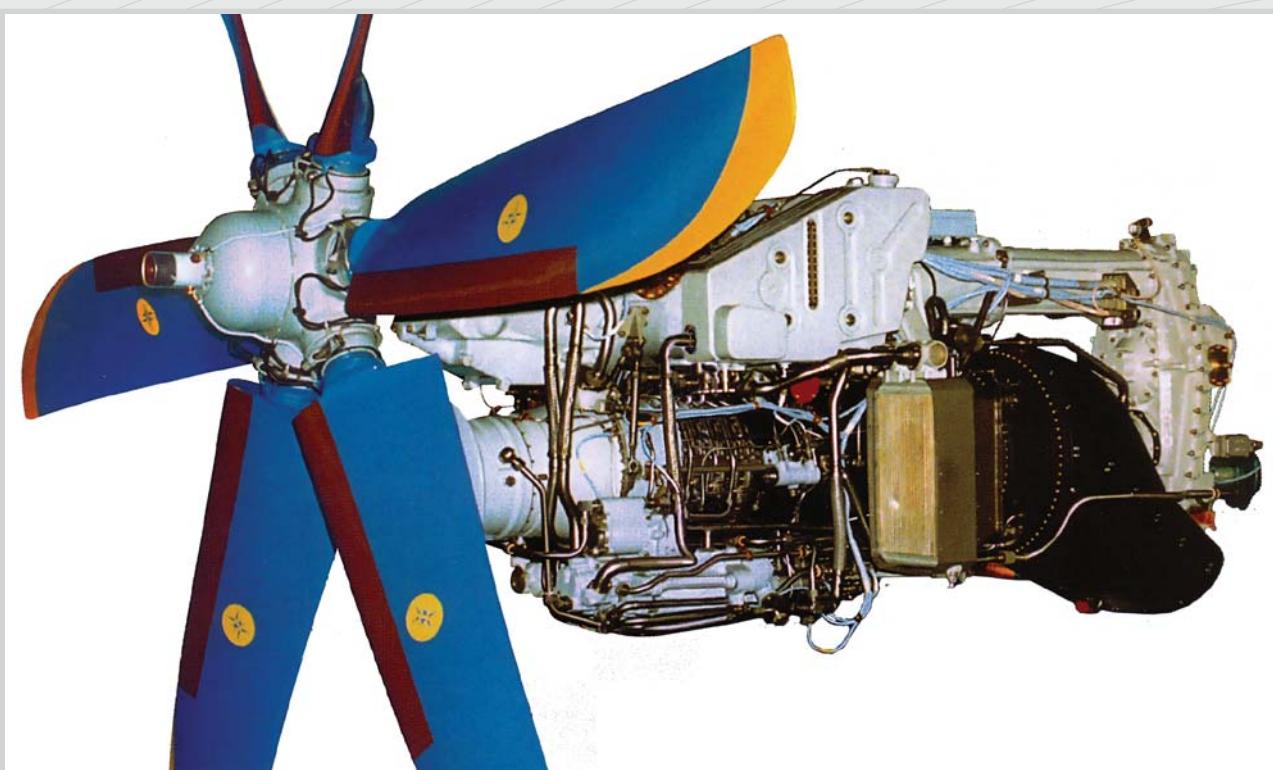
#### BASIC SPECIFICATIONS

	TV3-117MA	TV3-117MA Series 02
Emergency power condition (SLS, ISA):		
Power, shp (kW)	2400 (1765)	2400 (1765)
Takeoff power condition (SLS, ISA):		
Power, shp (kW)	2200 (1618)	2200 (1618)
Specific fuel consumption, kg/hp·h (kg/kW·h)	0.210 (0.286)	0.210 (0.286)
Cruise power condition (SLS, ISA):		
Power, shp (kW)	1500 (1103)	1500 (1103)
Dry weight, kg	294	294



## ENGINES

### TV3-117VMA-SBM1V TURBOSHAFT ENGINE



This engine is intended for new helicopters and for retrofitting the in-service helicopters.

It maintains the propulsion power under high and hot conditions to higher ambient temperature as compared to the TV3-117 engine early modifications, which improves significantly the performance of helicopters. The engine automatic control system permits to set the takeoff power within the range of 2,000 to 2,500 hp (depending on the engine application). All engine versions provide 2,800 hp in the contingency power condition.

The engine has been developed capable of updating nearly all TV3-117 family engine versions now in service to the TV3-117VMA-SBM1V, standard retaining their interchangeability.

The engine guarantees the retention of high flight performance of helicopters even if they are equipped

with high-efficiency dust-protecting and exhaust-shielding devices.

#### ENGINE BASIC MERITS

- high reliability;
- increased power maintained in hot and high conditions;
- low SFC;
- long service life;
- easy in-service maintenance;
- high repairability;
- stable operation under conditions of heavy smoke and dust;
- capability of long operation under maritime conditions;
- low cost of life cycle;
- interchangeability with early TV3-117 family engine versions

#### SPECIFICATIONS

Contingency power condition (SLS, ISA):

Power, shp (kW)	2800 (2059)
-----------------	-------------

Takeoff power condition (SLS, ISA):

Power, shp (kW)	2000 (1470) ... 2500 (1838)
-----------------	-----------------------------

up to +51 ... up to +35

Flat-rated, °C (SLS)	0.220 (0.2991) ... 0.209 (0.284)
----------------------	----------------------------------

Cruise power condition (SLS, ISA):

Power, shp (kW)	1500 (1104) ... 1750 (1287)
-----------------	-----------------------------

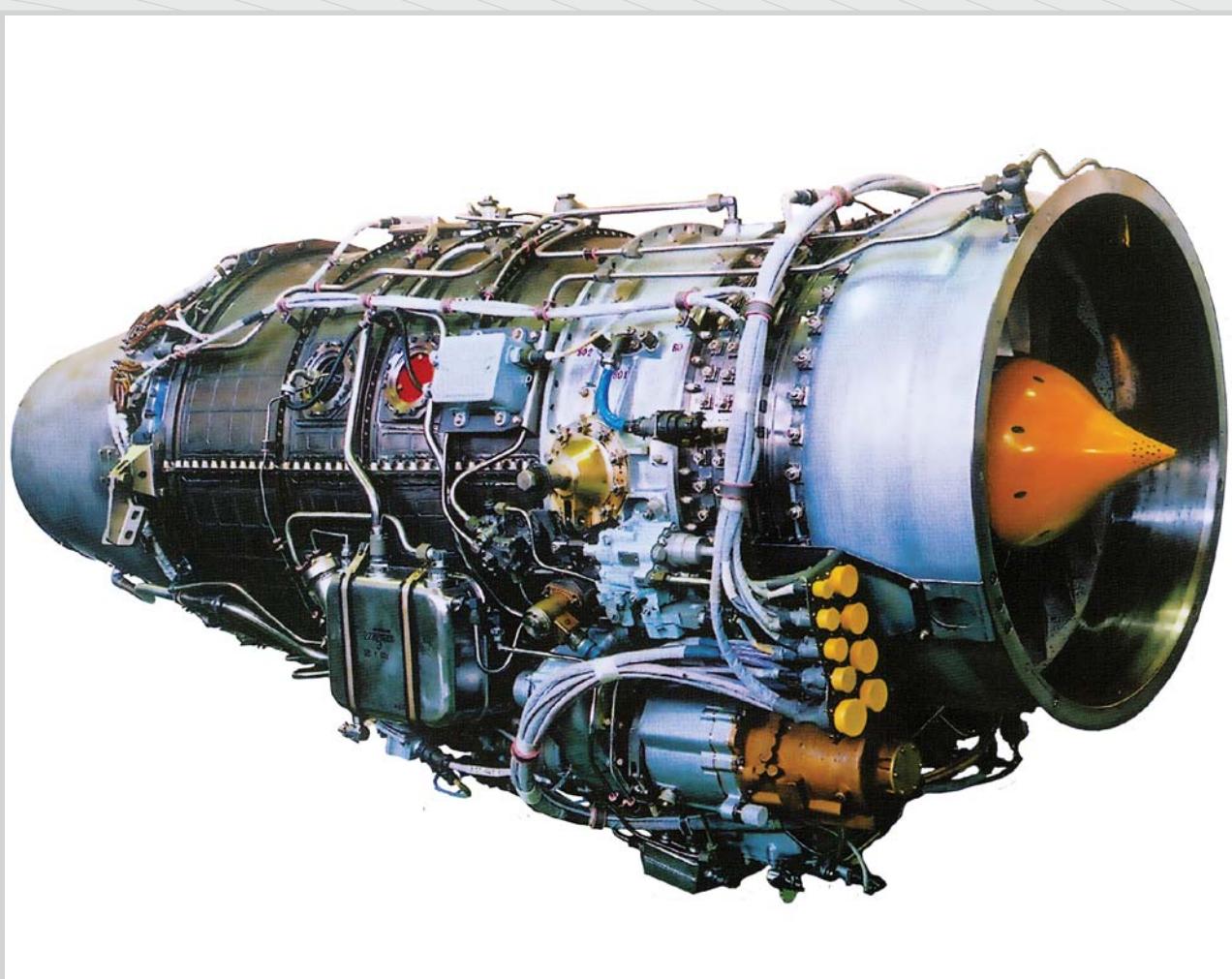
Dry weight, kg	295
----------------	-----





## ENGINES

### AI-222-25 TURBOFAN ENGINE



The engine has been optimized to be operated on up-to-date trainer, combat trainer, and light combat aircraft and complies with strict requirements for the engines of this class.

Using the AI-222-25 engine will allow creating a number of highly competitive aircraft.

At customer's request, AI-222-25 engine can be equipped with vectored thrust nozzles or their versions with afterburners can be developed.

#### **MAIN ADVANTAGES OF THE ENGINE:**

- high reliability;
- optimum performance;
- low noise, emission, and infrared signature;
- long service life;
- low operating costs

#### **SPECIFICATIONS**

Maximum power condition (SLS, ISA,  $\sigma_{in}=1.0$ ):

Thrust, kgf (kN)	2500 (24.52)
------------------	--------------

SFC, kg/kgf·h (kg/kN·h)	0.64 (65.2)
-------------------------	-------------

Maximum power condition ( $H=5000$  m;  $M_f=0.6$ ; ISA,  $\sigma_{in}=0.97$ ):

Thrust, kgf (kN)	1450 (14.22)
------------------	--------------

Cruise power condition ( $H=10000$  m;  $M_f=0.6$ ; ISA,  $\sigma_{in}=0.97$ ):

Thrust, kgf (kN)	300 (2.94)
------------------	------------

SFC, kg/kgf·h (kg/kN·h)	0.875 (89.2)
-------------------------	--------------

Dry weight, kg	440
----------------	-----



# ENGINES

## AI-222-25F TURBOFAN ENGINE WITH AFTERBURNER

The AI-222-25F afterburning version of the AI-222-25 turbofan engine featuring a thrust at takeoff of 42000kgf (thrust reheat ratio is 1.68) is designed to power trainers, advanced trainers and light combat aircraft with minimum flight speed of M 1.5. The engine has been optimized to be operated on up-to-

date trainer, combat trainer, and light combat aircraft and complies with strict requirements for the engines of this class. The turbine compressor section of the engine is fully unified with that of the AI-222-25 basic engine.

### SPECIFICATIONS

Full afterburner thrust rating (SLS, ISA,  $\sigma_{inl}=1.0$ ):

Thrust, kgf (flat rated to ISA+15°C), not less	4200
--	------

SFC, kg/kgf·h, not more	1.9
-------------------------	-----

(H=11000 m;  $M_{fl}=1.4$ ; ISA;  $\sigma_{inl}=0.97$ ):

Thrust, kgf	2760
-------------	------

Max thrust rating SLS, ISA, $\sigma_{inl}=1.0$	
--	--

Thrust, kgf	2500
-------------	------

SFC, kg/kgf·h, not more	0.66
-------------------------	------

Air flow rate, kg/s	49.7
---------------------	------

Pressure ratio	15.43
----------------	-------

By-pass ratio	1.18
---------------	------

Maximum TIT, K	1471
----------------	------

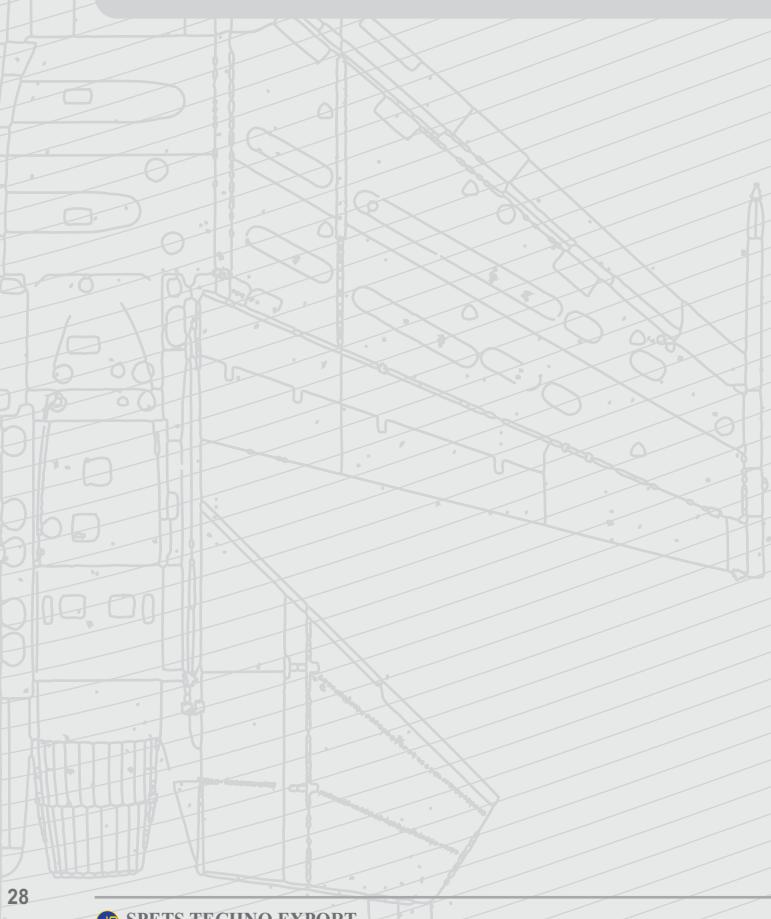
Dimensions and weight	
-----------------------	--

Fan diameter, mm	624
------------------	-----

Length, mm	3138*
------------	-------

Weight, dry (to State Standard 17106-90), kg, not more	560
--	-----

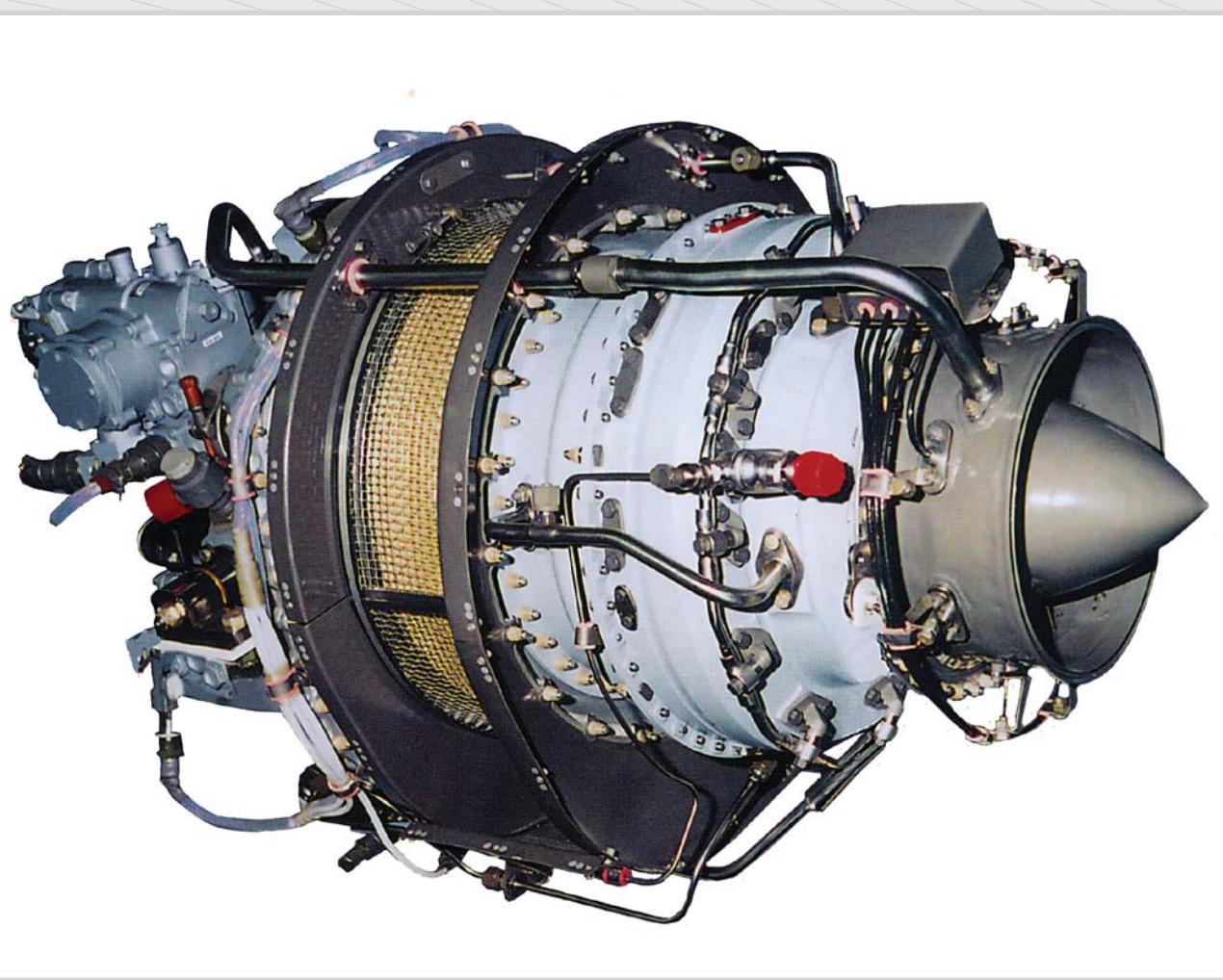
\* length from front flange to nozzle throat





## ENGINES

### AI-450 TURBOSHAFT ENGINE



Designed to be used as a propulsion power plant for helicopters of different application with load-carrying capacity 1500 to 2000 kg (Ka-226 with AI-450 engines and others).

The engine design employs a two-rotor scheme including a gas generator rotor and a free turbine rotor. The free turbine transmits power to the main gearbox, which is installed in front of the engine,

through a shaft, which passes inside the gas generator rotor shaft.

#### **The engine consists of three modules:**

- generator (engine air inlet section, compressor, combustion chamber and compressor turbine);
- reduction gear with accessory drive gearbox;
- free power turbine.

#### **BASIC SPECIFICATIONS**

Emergency power condition (SLS, ISA+15°C):

Power, kW (hp)	404.5 (550)
----------------	-------------

Takeoff power condition (SLS, ISA+15°C):

Power, kW (hp)	342 (465)
----------------	-----------

Specific fuel consumption, kg/kW·h (kg/hp·h)

0.353 (0.260)
---------------

Maximum continuous power condition (SLS, ISA+15°C):

Power, kW (hp)	294 (400)
----------------	-----------

Maximum cruise power condition (SLS, ISA+15°C):

Power, kW (hp)	221 (300)
----------------	-----------

Specific fuel consumption, kg/kW·h (kg/hp·h)

0.404 (0.297)
---------------

Dry weight, kg

103
-----



## ENGINES

### AI-450-MS GAS-TURBINE AUXILIARY ENGINE

The AI-450-MS is an up-to-date gas-turbine auxiliary engine of two-shaft design featuring equivalent power of 222 kW. The engine is to be used in the An-148 passenger plane and other various-purpose planes.

High efficiency of application of the AI-450-MS auxiliary engine built by Motor Sich JSC on the basis of the gas generator of AI-450 gas-turbine engine developed by SE IVCHENKO-PROGRESS is provided due to:

- low SFC resulting from high parameters of thermodynamic cycle, high efficiency of units and

choice of construction providing air bleeds from auxiliary compressor;

- low operating cost.

#### PURPOSE:

- generation of compressed air for starting propulsion gas-turbine engines;
- electrical power supply with 200/115 VAC, 400 Hz, power up to 40 kVA;
- generation of compressed air for aircraft conditioning system;
- generation of compressed air for aircraft anti-icing system.



#### SPECIFICATIONS

(SLS; ISA)

Absorbed power to drive generator, kW	40
Bleed air consumption, kg/s	1.127
Bleed air pressure, kgf/cm <sup>2</sup>	4.75
Bleed air temperature, °C	230
Fuel consumption, kg/h	118

#### MERITS:

- Use of the AI-450-MS auxiliary engine allows to:
- Expand the range of aircraft utilization;
- Reduce operating time of propulsion engines;
- Improve safety of aircraft maintenance;
- Reduce expenditures for auxiliary ground facilities and maintenance personnel;
- Ensure additional air and electric power source in flight up to altitude of 12000 m.

The engine meets the latest technical requirements and is equipped with full-authority digital electronic control system that can ensure control, monitoring, diagnostics and indication of troubles as well as counting of operation time.

Expected applications: An-148, Tu-334, Be-200, Yak-42, An-74TK-300 and other airplanes.



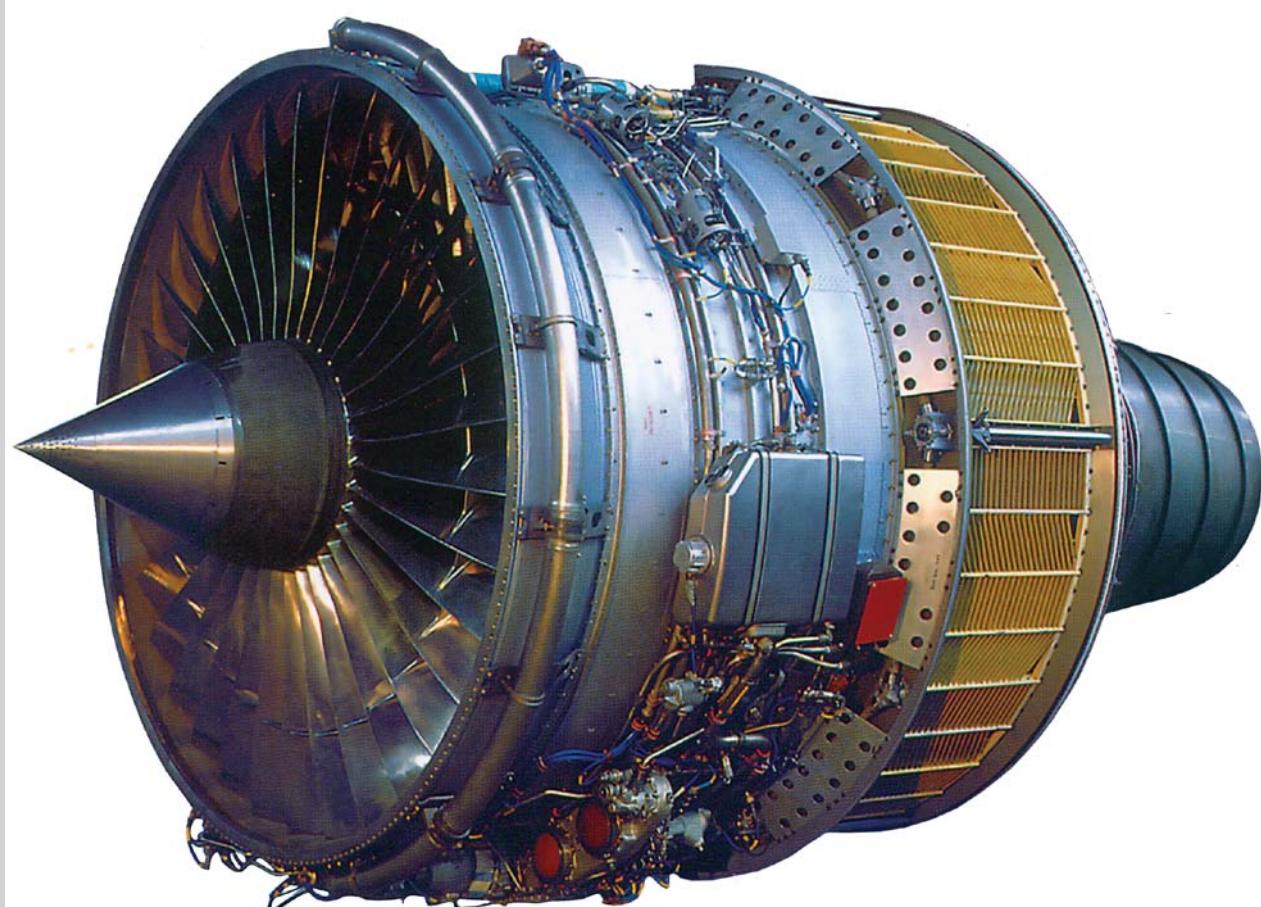
## ENGINES

### D-18T FAMILY TURBOFAN ENGINES

The D-18T is used to power the An-124, An-124-100 Ruslan and An-225 Mriya cargo aircraft. The engine is equipped with an efficient thrust reverser mounted in fan duct. The engine's module design together with efficient component condition diagnostics means provides possibility of on-condition operation without plant overhauls.

#### Main advantages of the engine:

- high takeoff thrust;
- low specific fuel consumption;
- low noise and pollutant emission levels (comply with ICAO standards);
- high maintainability and repairability



#### BASIC SPECIFICATIONS

Engine	D-18T, Series 1; D-18T, Series 3
Takeoff power (SLS, ISA):	
Thrust, kgf (kN)	23 430 (229.85)
Specific fuel consumption, kg/kgf·h (kg/N·h)	0.34 (0.0347)
Maximum cruise power ( $H=11\ 000\ m$ , $M_{fl}=0.75$ , ISA):	
Thrust, kgf (kN)	4860 (47.68)
Specific fuel consumption, kg/kgf·h (kg/N·h)	0.546 (0.0557)
Dry weight, kg	4100



## ENGINES

### D-27 TURBOPROPFAN ENGINE



The D-27 is designed to power the An-70, An-70T, An-180, Be-42 airplanes as well as other highly efficient passenger and cargo planes.

The engine is the result of extensive experience in development of propfan engines.

#### Main advantages of the engine:

- high efficiency;
- high reliability and trouble-free operation;

- low maintenance man hours;
- continuous monitoring of a complex of parameters under algorithms for testing the engine and propfan conditions;
- low emission level;
- low noise level.v

#### BASIC SPECIFICATIONS

Takeoff power condition (SLS, ISA +15 °C, PAMB=730mm Hg):

Equivalent, ehp (kW)	14000 (10294)
----------------------	---------------

Specific fuel consumption, kg/ehp·h (kg/eqkW·h)	0.170 (0.231)
---	---------------

Maximum cruise power condition ( $H = 11000$  m,  $M_{fl} = 0.7$ , ISA):

Equivalent power, ehp (kW)	6750 (4963)
----------------------------	-------------

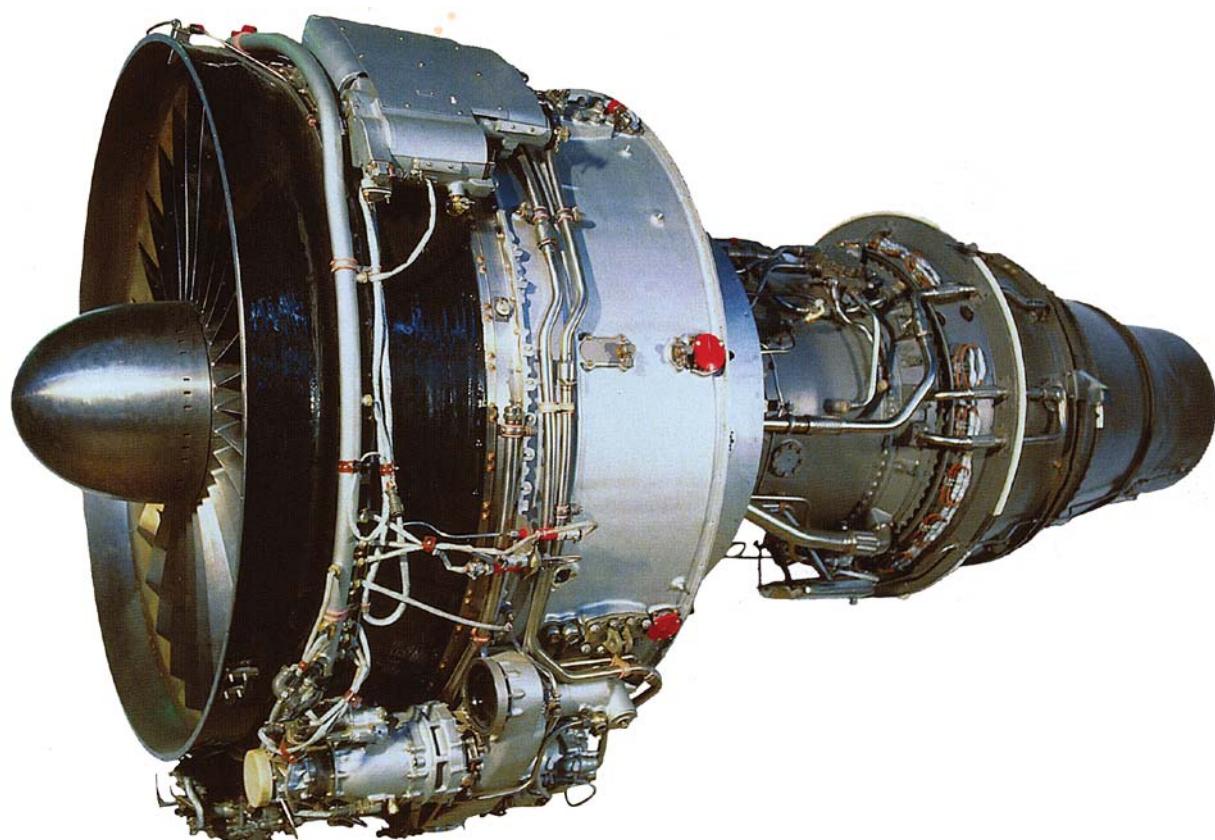
Specific fuel consumption, kg/ehp·h (kg/eqkW·h)	0.130 (0.177)
---	---------------

Dry weight, kg	1650
----------------	------



## ENGINES

### D-36, SERIES 1, 2A, 3A TURBOFAN ENGINES



The D-36, series 1, turbofan engines are installed in Yak-42 passenger airplanes. The D-36, series 2A, 3A, turbofan engines are installed in An-72 and An-74 transport airplanes.

Perfect design and highly developed mass production ensure the engine's quality and reliability.

Easy maintenance and possibility of comprehensive operational diagnostics of the engine on wing bring about reliable engine on-condition operation.

#### **Main advantages of the engine:**

- low specific fuel consumption;
- high reliability;
- long service life;
- low levels of noise and emissions of air pollutants;
- high maintainability and repairability ensured by the modular design;
- universal mount for installing the engine on various airplanes in underwing or overwing, fuselage or side positions without changing the engine design

#### **BASIC SPECIFICATIONS**

	D-36 Ser. 1, Ser. 2A	D-36, Ser. 3A
Emergency power condition (SLS, ISA +15 °C):		
Thrust, kgf (kN)	6500 (63.76)	
Takeoff power condition (SLS, ISA):		
Thrust, kgf (kN)	6500 (63.76)	6500 (63.76)
Specific fuel consumption, kg/kgf•h (kg/kN•h)	0.350 (35.7)	0.350 (35.7)
Cruise power condition (H = 8000 m, Mfl = 0.75, ISA):		
Thrust, kgf (kN)	1600 (15.69)	1600 (15.69)
Specific fuel consumption, kg/kgf•h (kg/kN•h)	0.630 (64.2)	0.630 (64.2)
Dry weight, kg	1124	1124



## ENGINES

### D-36 SERIES 4A TURBOFAN ENGINE

The D-36, Series 4A, engine is designed to be installed in the An-74TK-300 airplane.

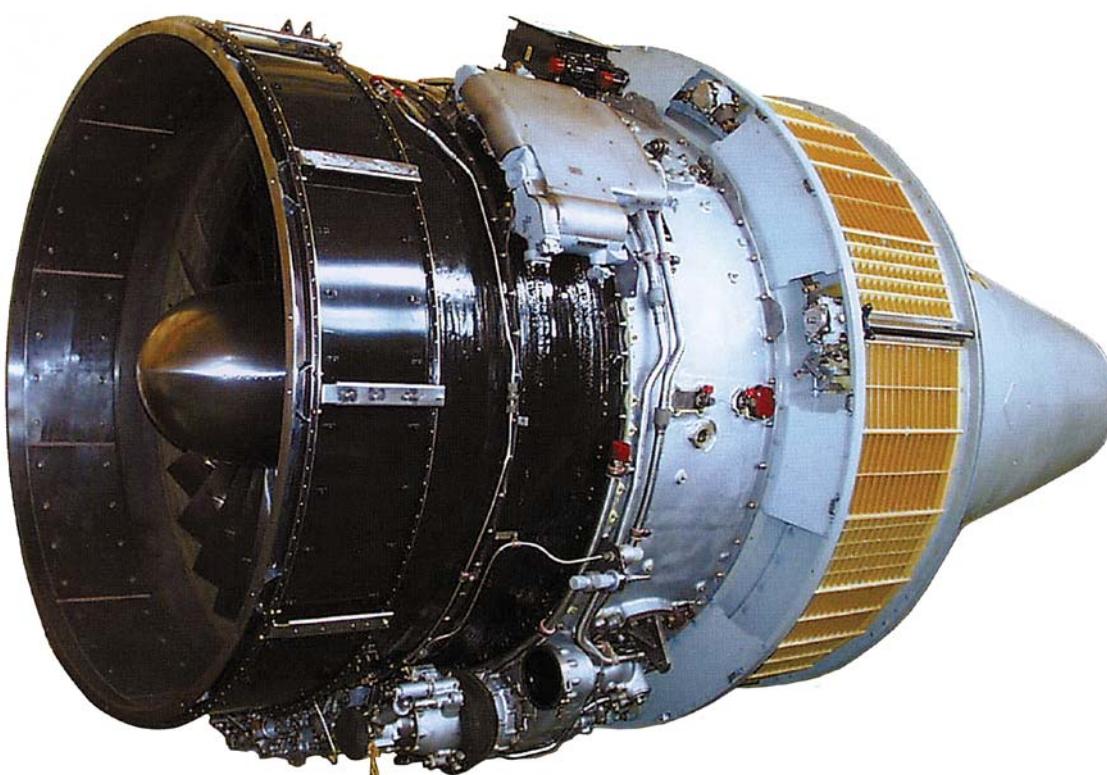
High quality and reliability of this engine are ensured by the perfection of design of the base D-36, Series 3A, engine and high degree of mastering of the series production process.

Ease of the engine maintenance and possibility to perform its profound 'on-the-wing' diagnostics permit reliable on condition operation of this engine.

#### Basic merits of the engine:

- low specific fuel consumption;
- high degree of reliability;

- long service life;
- low level of noise and harmful matter emission;
- ease of maintainability and high level of repair ability ensured by the engine modular design;
- engine mount design permitting to install the engine at an underwing pylon;
- availability of thrust reverser;
- all-weather and all-climate design of the base An-74 airplane makes it possible to operate the An-74TK-300 model in various climatic conditions, and availability of the emergency power condition permit the airplane to take off from high-altitude airfields ( $H = 4000$  m)



#### BASIC SPECIFICATIONS

Emergency power conditions (SLS, ISA +15°C):

Thrust, kgf (kN)	6500 (63.76)
------------------	--------------

Takeoff power condition (SLS, ISA):

Thrust, kgf (kN)	6500 (63.76)
------------------	--------------

Specific fuel consumption, kg/kgf·h (kg/kN·h)

0.350 (35.7)

Max. cruise power condition ( $H = 8000$  m, Mfl = 0.75, ISA):

Thrust, kgf (kN)	1600 (15.69)
------------------	--------------

Specific fuel consumption, kg/kgf·h (kg/kN·h)

0.630 (64.2)

Max. cruise power condition ( $H = 9150$  m, Mfl = 0.60, ISA):

Thrust, kgf (kN)	1500 (14.71)
------------------	--------------

Specific fuel consumption, kg/kgf·h (kg/kN·h)

0.560 (57.1)

Engine weight mass, kg

1130



## ENGINES

### D-136 and D-136 SERIES 1 TURBOSHAFT ENGINES

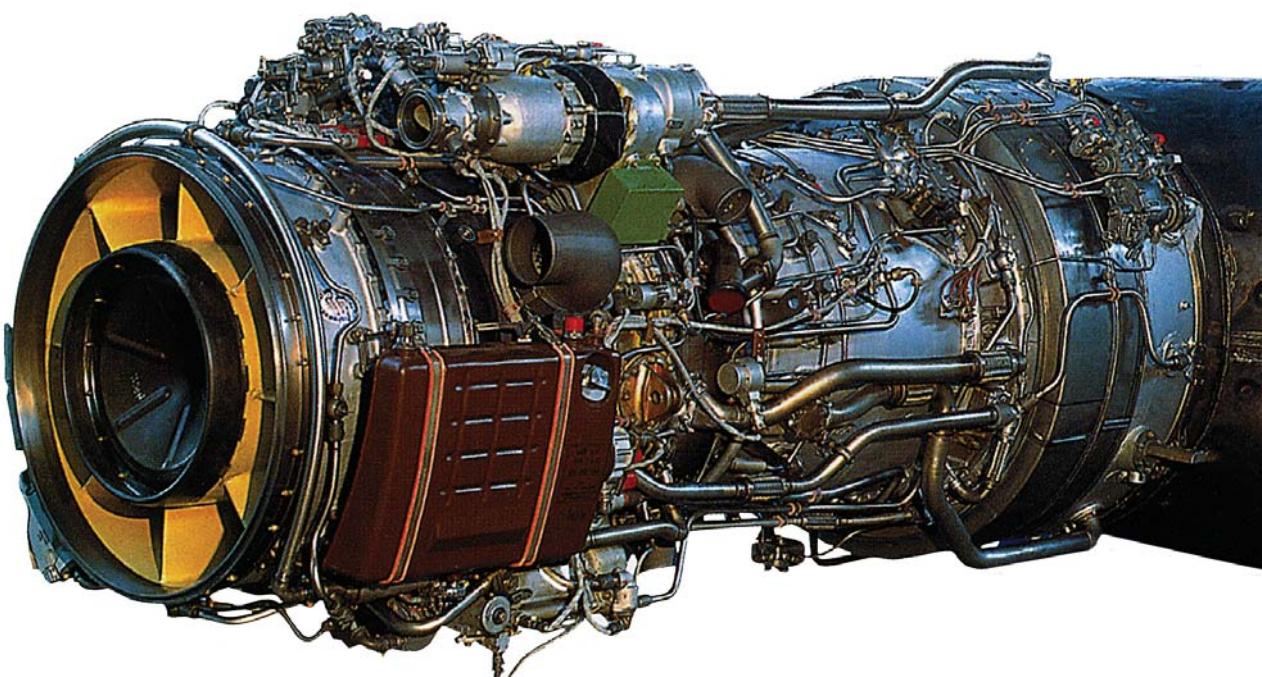
The D-136 and D-136 series 1, turboshaft engines are used to power the world's largest Mi-26 transport helicopter and its modifications.

Perfect design and highly developed production ensure the engine's quality and reliability.

Easy maintenance and high repair ability are ensured by a modular design of the engine.

#### **Main advantages of the engine:**

- low specific fuel consumption;
- high reliability;
- high power;
- easy maintenance and high repair ability;
- low weight-to-power ratio.



#### **BASIC SPECIFICATIONS**

Maximum takeoff power conditions (SLS, ISA):

Power, shp (kW)	11400 (8382)
-----------------	--------------

Specific fuel consumption, kg/hp·h (kg/kW·h)	0.194 (0.263)
--	---------------

Cruise power conditions ( $H = 4600$  m,  $M_{fl} = 0.13$ , ISA):

Power, shp (kW)	6100 (4486)
-----------------	-------------

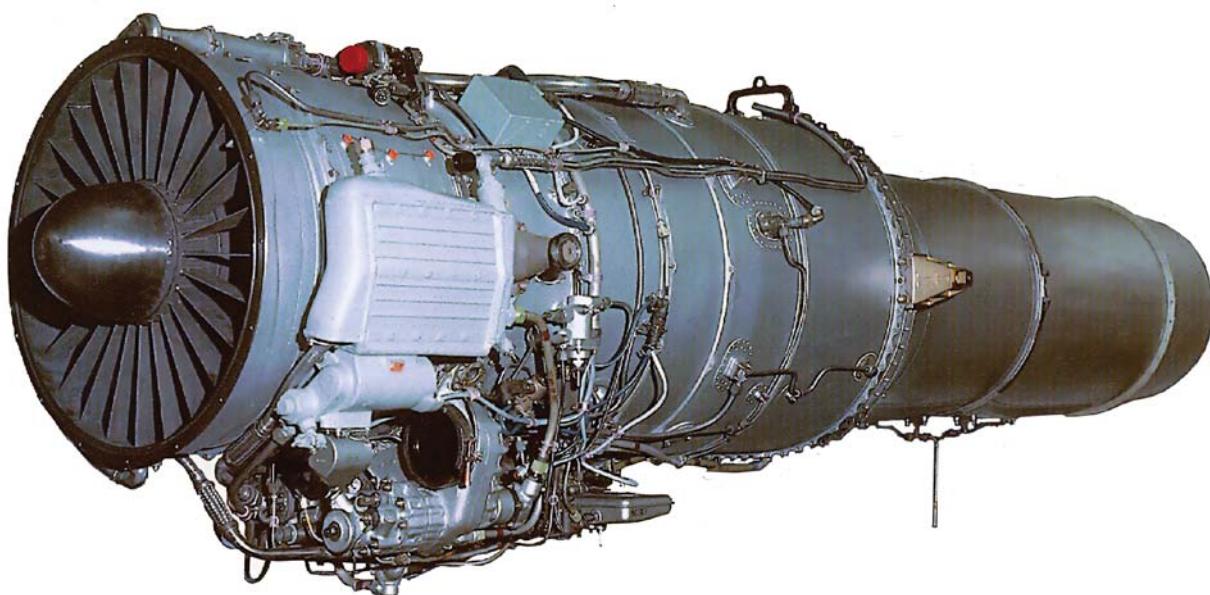
Specific fuel consumption, kg/hp·h (kg/kW·h)	0.230 (0.312)
--	---------------

Dry weight, kg	1077
----------------	------



## ENGINES

### AI-25TL, AI-25TLK TURBOFAN ENGINE



The AI-25TL engine is intended for L-39, the AI-25TLK engine is intended for K-8J aircraft and other trainers. It is successfully operated worldwide.

The engine is an AI-25 turbofan follow-on. As compared with the base engine, the AI-25TL (AI-25TLK) engine is distinguished by a higher compressor pressure ratio and higher turbine inlet temperature, all that increasing the engine thrust.

The engine is equipped with a special lubrication system to enable normal operation under zero-g and negative-g conditions.

#### Main advantages of the engine:

- high reliability and trouble-free operation;
- longer service life as compared with other similar engines;
- high maintainability;
- potential to further increase the engine performances after insignificant design changes.

#### BASIC SPECIFICATIONS

	AI-25TL	AI-25TLK
Maximum thrust rating (SLS, ISA):		
Thrust, kgf (kN)	1720 (16,87)	1720 (16,87)
Specific fuel consumption, kg/kgf•h (kg/kN•h)	0,575 (58,6)	0,575 (58,6)
Overall dimensions, mm:		
Length (with extension pipe)	3358	2860
Width	985	868
Height	958	959,5
Dry weight, kg	350	350



## ENGINES

### AI-25TLSh TURBOJET BYPASS ENGINE

This turbofan is a version of the mass-produced AI-25TL engine mounted in the L-39 and K-8J trainer aircraft. It can power combat-trainer modifications of these aircrafts and be adapted to power other existing trainer and combat trainer aircraft and those under development to be used as light attack aircraft. In this respect, a combat power rating of enhanced maximum thrust, employed for strike operations, has been additionally introduced and engine acceleration time has been substantially reduced.

**The engine features:**

- high reliability ensuring the highest possible flight safety, which is proved by the fact that around 5,000

AI-25TL engines are operated in 37 countries, their total operating time approaches to 7,000,000 hours;

- high level of gas-dynamic stability at external disturbances, including those when launching onboard weapons;
- high fuel efficiency;
- insignificant labor and time input for maintenance;
- minimum life cycle cost.

The engine preserves the previous design of automatic control system to provide retrofitting the earlier produced L-39 and K-8J aircraft. At a customer's request, the engine can be modified to be controlled by

**BASIC SPECIFICATIONS**

	Combat	Training
<b>Maximum power condition (H = 0, M = 0, ISA):</b>		
Thrust, kgf (kN)	1850 (18.15)	1720 (16.87)
SFC, kg/(kgf·h) (kg/kN·h)	0.575 (58.6)	
<b>Maximum power condition (H = 0, M = 0.6, ISA +15 °C):</b>		
Thrust, kgf (kN)	1250 (12.26)	1100 (10.79)
<b>Cruise power condition (H = 8000 m, Mfl = 0.75, ISA):</b>		
Thrust, kgf (kN)	1600 (15.69)	1600 (15.69)
Specific fuel consumption, kg/kgf·h (kg/kN·h)	0.630 (64.2)	0.630 (64.2)
Dry weight, kg	1124	1124



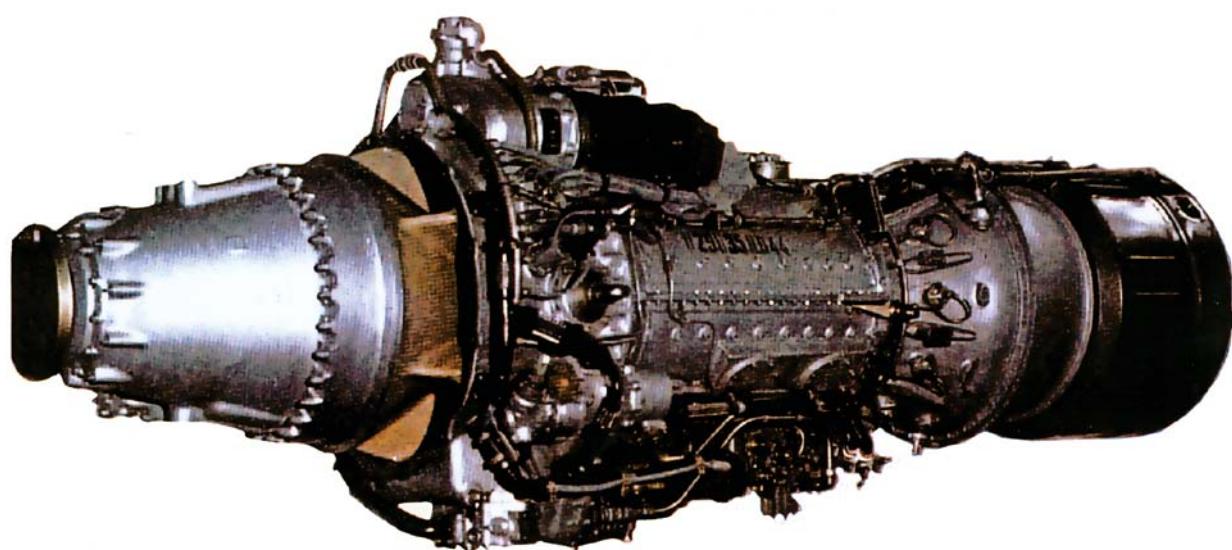
# ENGINES

## AI-20 FAMILY TURBOPROP ENGINES

These engines are designed for installation in airplanes Il-18, Il-38, An-8, An-12, An-32, An-32V-200, Be-12 and their versions, which are servicing medium- and long-range routes (up to 6500 km). The AI-20 family engines feature a wide gas dynamic stability margin at all power conditions, altitudes and flight speeds.

### Engine main advantages:

- high reliability;
- long service life;
- simple and optimal maintenance.



### BASIC SPECIFICATIONS

Engine	AI-20K	AI-20M	AI-20D	AI-20D Series 5	AI-20, Series 5M
Emergency power (SLS, ISA)					
Equivalent power, eq.h.p. (eq.kW)				5180 (3809)	
Takeoff power (SLS, ISA)					
Equivalent power, eq.h.p. (eq. kW)	4000 (2941)	4250 (3125)	5180 (3809)	5180 (3809)	4750 (3493)
Specific fuel consumption, kg/eq.hp.·h (kg/eq. kW·h)	0,270 (0,367)	0,239 (0,325)	0,227 (0,309)	0,227 (0,309)	0,230 (0,313)
Cruise power (H=8000 m, Mfl=0.57, ISA)					
Equivalent power, eq.h.p. (eq. kW)	2490 (1844)	2700 (1986)	2990 (2214)	2725 (2004)	2725 (2004)
Specific fuel consumption, kg/eq. hp.·h (kg/eq. kW·h)	0,210 (0,286)	0,197 (0,268)	0,196 (0,266)	0,199 (0,271)	0,199 (0,271)
Engine dry weight, kg	1080	1040	1040	1040	1040



## ENGINES

### AI9-3B AUXILIARY GAS-TURBINE ENGINE

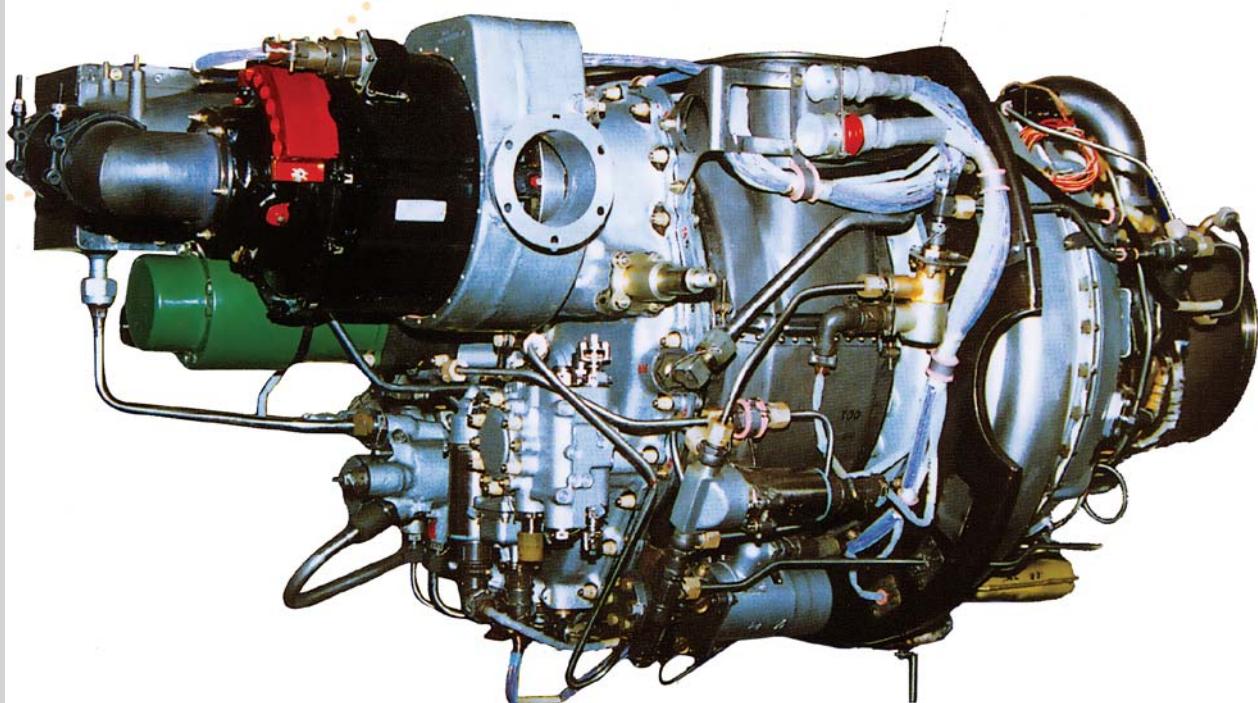
AI9-3B auxiliary gas-turbine engine is designed for the An-140 airplanes and other airplanes and helicopters.

The gas-turbine engine has been developed on the background of vast experience in manufacturing and operating the AI-9 base gas-turbine engine and it brings about low production costs, high reliability, and long service life.

The gas-turbine engine is used for starting aircraft propulsion engines and conditioning crew cabin and passenger compartment together with powering airborne electric equipment.

#### **Main advantages of the engine:**

- Use of AI9-3B gas-turbine engine provides for:
- Expansion of range of aircraft utilization
- Reduction of propulsion engines operating time
- Improvement of safe aircraft maintenance
- Reduced expenditures for auxiliary ground facilities and maintenance manpower
- Availability of additional air and electric power source in flight up to 6000 m.



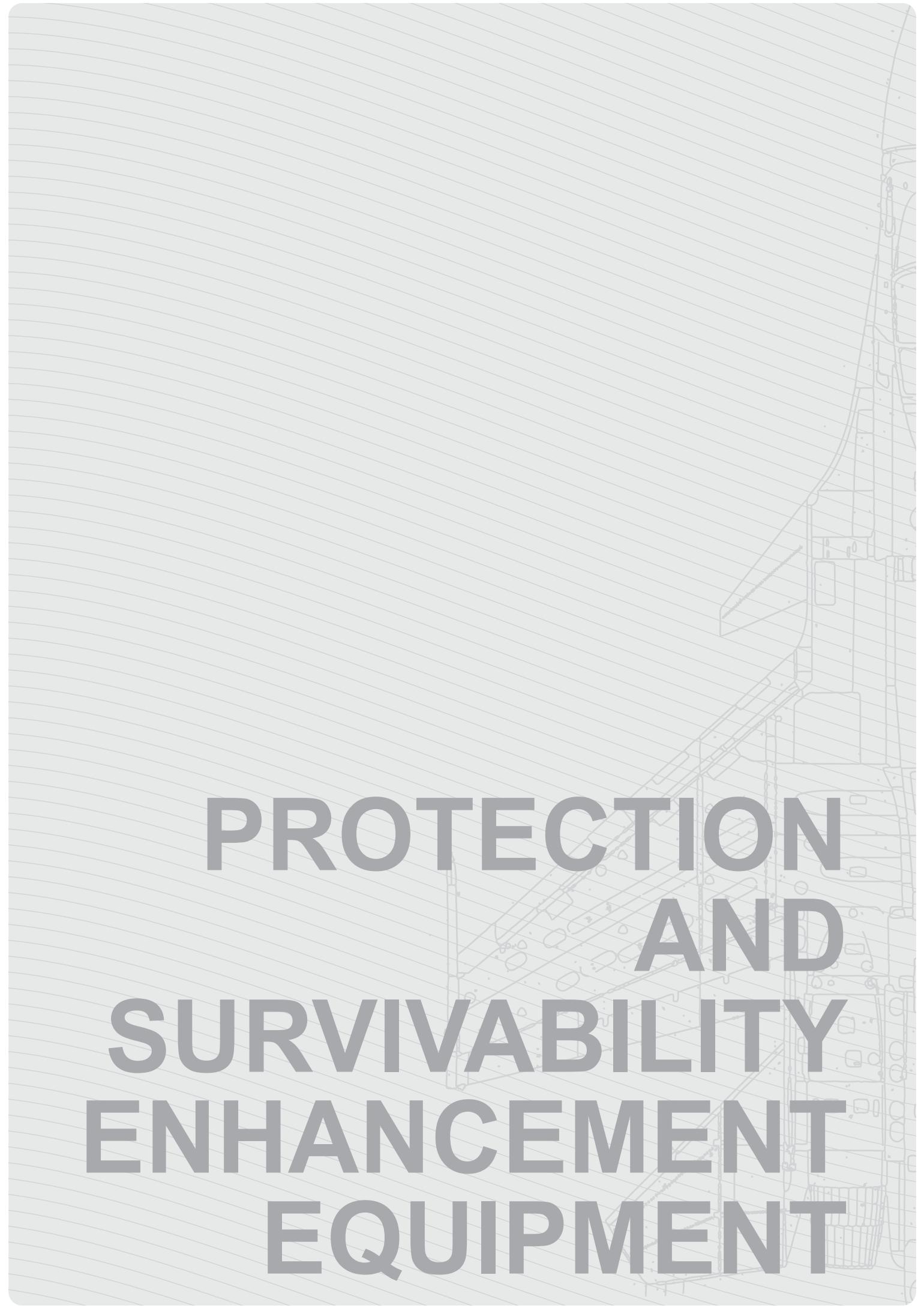
#### **BASIC SPECIFICATIONS (SLS, ISA +30°C)**

AC aircraft electric system power supply, kV•A	16
Bled air flow, kg/s	0.47
Bled air pressure, kgf/cm <sup>2</sup>	4.0
Bled air temperature, °C	225
Fuel consumption, kg/h	92
Total engine weight, kg, max	112



**NEW** TIME  
TECHNOLOGY





# **PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT**



## PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT

### «Adros» KUV 26-50 Multicalibre flare dispenser

Holds and dispenses two calibre flares under special programs to provide complicated interference situation for infrared homing heads.

#### Design features

- Flares of two calibre: 26 mm and 50 mm in one holder.
- Digital control system.
- Built-in-test.
- Reprogramming function.
- Ready to work under the control of MAWS sensors.
- Simple and reliable design.
- Does not need specially qualified specialists.

#### Main specifications

- Calibre: 26 mm and 50 mm.
- Flare type: PPI-26, PRP-26, PPI-50, PRL-50, etc.
- In one holder flare quantity: 10 pcs of 50 mm and 20 pcs of 26 mm.
- Number of controlled holders: from 2 to 20.
- Protection zone – circled.
- Modes: automatic (under MAWS control); manual; emergency; built-in-test.
- Shooting flares from one (right or left board) side or from both.

- Continuous working time – not less than 4 hours.
- Readiness time – up to 5 s.
- Power supply: 27V DC.
- Power consumption – up to 250 Wt.
- Weight : control unit – up to 0.5 kg, empty holder – up to 15 kg.

#### Performance

- Specified life – 2000 hours.
- First overhaul service life – 1000 h in 15 years.
- Overhaul life – 500 hours in 7.5 years.
- Useful life – up to 30 years.
- Guarantee – under the contract.



### PIK-01V engine exhaust shield system

The system purpose is to suppress an engine IR signature. This additional element is necessary to increase the efficiency of "Adros" KT-01AVE IRDM station. PIK-01V variant is designed for Mil design bureau helicopters, such as Mi-8, Mi-17 (fig. 7), Mi-25, Mi-35 etc., as well as Kamov design bureau helicopters such as Ka-27, Ka-31, etc., and provides decrease of its visibility in infra-red band of wave lengths in all operational modes.

Original design solutions allow to decrease temperature of exhaust gases and temperature of design

elements due to increase of heat exchange area, special screens and air ejector systems.

#### Basic performances:

1. Temperature of exhaust gases and design elements – not more than 200°C.
2. Power loss on free power turbine shaft - not more than 1.5 % on peak mode.
3. Degradation factor of IR radiation power in 3-5µm – not less than 3.5 – 4.
4. Weight of two shields (in set) - not more than 40 kgs





# PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT

## «Adros KT-01 AVE» Infra-red counter-measure system

Protection of helicopters and airplanes against defeat by guided missiles with infrared (IR) homing heads is one of priorities at the time. The reason is pretty high efficiency of such missiles as well as newly developed. Last decades local war experience shows that approximately 90 % of all aircraft defeats in military conflicts are provided by guided missiles with IR seekers.

### Technical profile of IR Jammer

Wavelength band	1,8-5,5 $\mu$ and 8-10 $\mu$
Source	Wide band IR source
Coverage	Azimuth: 360°
Jammer range	at least 5 km
Ability to jam the missile seekers of the type	Instantaneous and simultaneous jamming of seekers with amplitude-phase, frequency-phase, time-pulse modulation
Jamming protection for	First, second and third generation missile seekers
Communication interface	RS 422/1553B
Jamming code software	Software is designed in Assembler programming code and is flexible for reprogramming and future upgrades
Pointing accuracy	The system jams all the missiles with IR seeker in the field of coverage that makes it unnecessary to calculate coordinates of a specific missile
Power consumption	Max 4 KW. There is no stand by mode for the system. It operates continuously within the entire mission ensuring stable and permanent protection of the aircraft / helicopter.
Power supply	Standard power supply existing at helicopters / aircraft 28 v dc / 115 V / 208 V 3 $\phi$
Environmental condition	Compliant to MIL-STD-810E
EMI/EMC compliance	Compliant to 461 D
Mounting on the aircraft	Mounting interface for easy mounting on the helicopter / aircraft is available

Jam station "Adros" KT-01AVE provides active protection of helicopters against guided missiles with infrared homing heads. "Adros" station countermeasures to infrared homing heads with PPM, frequency-phase (FPM), time-pulse (TPM) modulation and to the seekers with high noninterference.

"Adros" KT-01AVE cracks a trajectory of such missiles, as "Stinger" (FPM), "Igla" (SA-18, TPM), "Igla-1" (SA-16, FPM), R-60 (FPM), R-60M (FPM), R-73 (TPM), "Sidewinder" (PPM, FPM) and others. Thus interference signal excess over the target signal is not required.



The main advantages "Adros" KT-01AVE are following:

1. Station does not require the information on type and frequency of approaching missile seeker.
2. It works without missile warning system.
3. Station does not require approaching missile tracking

system.

4. Station provides circular and permanent protected zone.
5. It has rather simple design and, as a consequence, high reliability and the comprehensible price.



## PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT

### «Adros» KT-03UE Station for optical-electronic suppression

The station is installed on helicopters and aircraft equipped with two turboprop engines. The station does not need any information regarding type of suppressed missiles and successfully functions without any launch detection system. In order to provide most effective protection of aircraft the system is used in combination with exhaust shields and / or flare dispensers.

#### Main technical features

##### Power supply:

- DC + 27 V;
- single-phase voltage 115 V, 400 Hz;
- two-phase voltage 208 V, 400 Hz.

##### Power consumption:

- 208 V, 400 Hz – not more than 5000 VA;
- 115 V, 400 Hz – not more than 500 VA;
- 27 V – not more than более 500 W.

System weight – not more than 40 kg.

##### Operating conditions:

- normal environment temperature from +20°C to – 15°C;
- elevated environment temperature: operating +60°C, short-term operating +70°C;
- lower environment temperature -50°C;
- elevated relative air humidity 98% (temperature +35°C).

The system consists of radiation unit and control unit.

Protection zone: by azimuth – 330°, by elevation – from – 20° to + 30°.

Start-up time – not more than 5 minutes.

SOES «Adros» KT-03UE ensures protection (missile attack failure):

- of helicopter – with probability 0,85;
- of aircraft – with probability 0,75.

Among additional features there are: built-in automatic test, re-programmability, unification (interchangeability of units), automated unified working mode.





## PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT

### «Adros» T-32C Multifunctional IRCM pod

T-32C IRCM pod provides effective protection of cargo planes such as Antonov An-26, An-32, An-140, An-70 and the same class aircraft against guided missiles equipped with IR homing heads of different target signal modulation type and jamming function.

#### Design features:

- Can be installed on original attachment points of Antonov An-26 and An-32, modernized for 26IKO pod installation.
- Three main variants:
  - T-32C mk.1 – multicalibre flare dispensers KUV 26-50;
  - T-32C mk.2 – multicalibre flare dispensers KUV 26-50 + missile approach warning system;

- T-32C mk.3 – multicalibre flare dispensers KUV 26-50 + missile approach warning system + "Adros" KT-02AS active jammer.

- Does not need specially qualified personnel.

#### Main specifications

- Flare quantity:

- 50 mm – up to 40 pcs in one pod
- 26 mm – up to 80 pcs in one pod

- Dimensions:

- length - 2.6 m;
- width – 0.4 m;
- height – 0.8 m.

- Empty weight – 190 kg.

- Full loading weight – 250 kg.





## PROTECTION AND SURVIVABILITY ENHANCEMENT EQUIPMENT

### ASO-2V / ASO-2VM / ASO-2E / ASO-2E-E7R Automatic radar and infrared jamming devices

Jamming is fulfilled by series of 4 and 16 charges with intervals of 2 - 4 sec / 2 - 6 sec (for ASO-2V/) and 1 - 0,3 sec (ASO-2E)

Jamming is fulfilled by series of 4 and 16 charges with intervals of 2 and 4 sec (ASO-2V. 0000-0-04 - with intervals of 2 and 6 sec). Besides, ASO-2VM. 0000-0-02 produces jamming with volley of 2, 4 and 8 shells.

ASO-2V.0000-0-01 and ASO-2VM can shoot when barrel is directed upwards or downwards, and others just with barrel directed downwards.

Operating voltage, V 27( $\pm 10\%$ )

Overall dimensions of the girder without connectors, mm 768,5 x 1255 x 60,5

Mass, kg

ASO-2V 0000-0	12,7
ASO-2V 0000-0-01	11,28
ASO-2V 0000-0-02	37,8
ASO-2V 0000-0-04	12,7
ASO-2VM 0000-0-02	12,7





## «SIRENA-3M» (S3M, SP10) Illumination warning station

Designed for crew warning on the aircraft illumination by the radar stations of interception and fire-control from any direction, as well as for chaffs dipole reset machine starting. Crew warning about illumination is made using warning lights and acoustic alarm. It is installed on the objects of the type AN-26, IL-76, MIG-21, MIG-23, MI-8, etc. It has a functional-block construction with use of hybrid integral microcircuities.

### Main technical characteristics:

Warm-up time, s, not more than 30;

Supply voltage:

- single-phase, V, Hz 115, 400;

27;

Power consumption:

- over circuit 115V, 400 Hz, VA, 16;

not more than

- over circuit, 27 V, W, not more than 16,5;

Weight without interface cables

(depending on completeness of the set),

kg, not more 2,95 - 3,35

## L006LM (SPO-15) Illumination warning station

Jamming is fulfilled by series of 4 and 16 charges with intervals of 2 - 4 sec / 2 - 6 sec (for ASO-2V/) and 1 - 0,3 sec (ASO-2E)

Jamming is fulfilled by series of 4 and 16 charges with intervals of 2 and 4 sec (ASO-2V. 0000-0-04 - with intervals of 2 and 6 sec). Besides, ASO-2VM. 0000-0-02 produces jamming with volley of 2, 4 and 8 shells.

ASO-2V.0000-0-01 and ASO-2VM can shoot when barrel is directed upwards or downwards, and others just with barrel directed downwards.

Operating voltage, V 27( $\pm 10\%$ )

Overall dimensions of the girder without connectors, mm 768,5 x 1255 x 60,5

Mass, kg

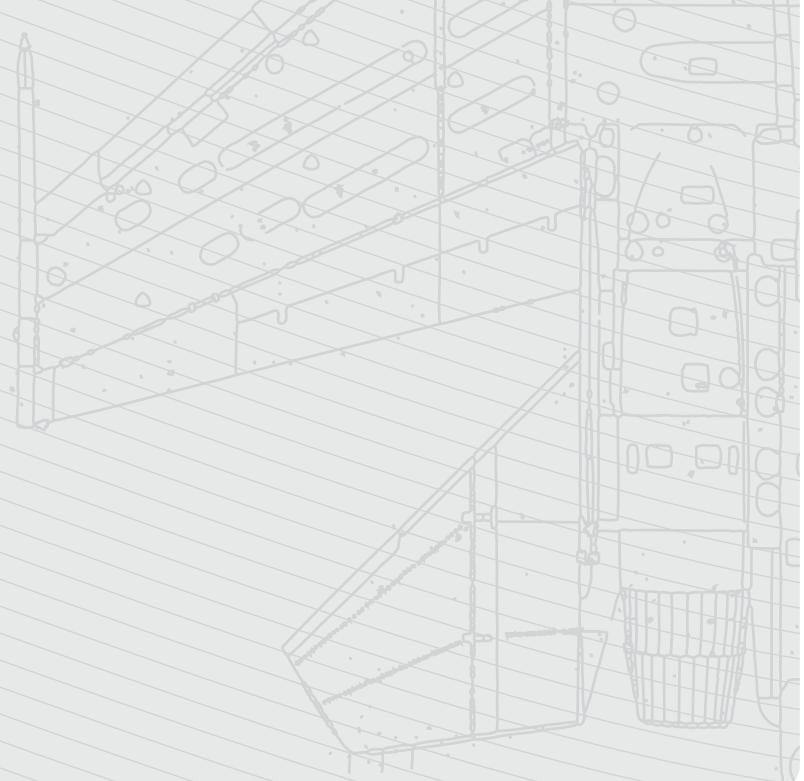
ASO-2V 0000-0 12,7

ASO-2V 0000-0-01 11,28

ASO-2V 0000-0-02 37,8

ASO-2V 0000-0-04 12,7

ASO-2VM 0000-0-02 12,7







# ARMAMENTS



## ARMAMENTS

### N019 Fire-Control Radar Complex

The N019 (N019E, N019M) radar is designed to operate in the armament control system of the MiG-29 airplane. The fire-control complex provides search, detection, identification, aiming, tracking and lighting of air targets to employ the airplane armament.

Supply of complete list of spare parts of N019 (N019E, H019M) radar.

Repair of the M45210 (M45212), M45211-1 (M45213-1), M55112 (M55104-1), U52157 (U52151-1), U52158 (U52155B) microwave modules, earlier unrepairable.

Upgrading of the least reliable assemblies and units of the N019 complex are constantly under way, allowing to considerably increase their reliability. Replacement of low-reliability parametric amplifier in the M55112 (M55104-1) microwave receiving module with the more reliable transistor low-noise amplifier. The results of use of the products have shown a considerable decrease in failures of the N019-09 modernized units and N019 radars as a whole.

#### Servicing equipment for maintenance and repair of the products in use:

- the PS7-055, PS7-061 devices, SV-N019/1 stand for check of the N019 radar;
- the ERP7-036 tester for repair of the N001-22A unit;
- the ERP7-036AR (ERP7-036AT) tester for repair of the N019-02 unit;
- the ERP7-037 tester for repair of the N019-09 unit;
- the ERP7-038 tester for repair of the N019-18, N019-30 units.



### «OSMINOG E» SEARCH AND SIGHTING SYSTEM

«OSMINOG E» search and sighting system is installed in KA-28 naval helicopter and designed to accomplish tasks of search, tracking and transfer of information to systems for the destruction of detected targets being submerged or surfaced, as well as radar-visible targets.

The System includes radar station to observe surface and for navigational problems, as well as sonar dipping by self-supporting cable for detection of underwater objects.

Detection range of submerged objects up to 8 km  
Detection range of surfaced objects up to 30 km

#### Main technical characteristics:

Aircraft electrical system voltage:

- three-phase, V, Hz 200, 400

- three-phase, V, Hz	36, 400
- DC,V	27
Power consumption kVA, not more than:	
- over circuits 200 V, 400 Hz	2,0
- over circuits 36 V, 400 Hz	0,1
- over circuit 27 V	1,0 W
- Weight, kg, not more than	459





## ARMAMENTS

### «Adros» FPM-01KV Sight mark forming laser system

Adds to helicopter the capability of unguided munitions operative deployment (rockets, artillery, bombs, etc.) in a dark conditions viewing sight mark directly on the ground target through night goggles.

#### **Design features:**

- Can be used autonomously as well as reserve aiming device for thermo vision (FLIR type) sights
- Can be connected to any aiming devices and systems
- Can be used on any helicopter types
- Does not limit piloting activity
- Forms sight mark directly on the ground target
- Light weight and small dimensions
- Easy service

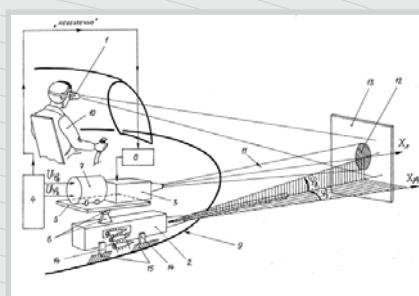
#### **Main specifications:**

- Sight mark observation distance (for night goggles sensitivity of  $5 \cdot 10^{-4}$  l) – at least 1.5 km

- Laser beam wavelength – according to night goggles waveband
- Laser beam deviation angles:
  - $\pm 12^\circ$  in azimuth;
  - from  $-30^\circ$  to  $+6^\circ$  in elevation
- Laser beam angle rate – at least  $20^\circ/s$
- Beam positioning accuracy – better than 1.5 mrad
- Readiness time – less than 3 min
- Power supply:
  - +27V DC, 40 Wt;
  - 36V AC x 400 Hz, 70 V·A.
  - Weight – less than 5 kg.

#### **Performance:**

- Specified life – 4000 flying hours.
- First overhaul service life – 1000 h in 7 years.
- Overhaul life – 1000 hours in 6 years.
- Useful life – up to 25 years.
- Guarantee – under the contract.



### UPGRADING OF ASP-17BC-8 SERIES AIRCRAFT SIGHTS

#### **FOR SU-17, SU-22, SU-25 AIRCRAFT, HELICOPTER MI-24 TYPES.**

The sight is upgraded by replacement of the obsolete analog-digital computing device with advanced microprocessor one, implementation of effective algorithms of exterior ballistics computation, connection with GPS receiver and air data module.

#### **New capabilities:**

- GPS-aided bombing in level flight and in pitch-up
- program changing of ballistics
- possibility of integration with modern systems and sensors as the sight senses both the digital and analog signals



## ARMAMENTS

### SURA HELMET-MOUNTED TARGET DESIGNATION SYSTEM

SURA Helmet-Mounted Target Designation System (HMTDS) can be used both in fixed-wing aircraft and helicopters for off-boresight aiming of guided weapon (IR missiles, turret gun) and viewing systems at visual targets.

#### Features:

- Optical helmet position tracking unaffected by electromagnetic environment, cockpit lighting and sunlight;

- High targeting accuracy;
- Modular design providing HMTDS integration without cockpit modification and standard helmet use;
- Units replaceability (no user sub-adjustment);
- Certified for safety requirements on a pilot ejection and emergency escape.



### SURA-I HELMET-MOUNTED TARGET DESIGNATION AND INDICATION SYSTEM

The SURA-I Helmet-Mounted Target Designation and Indication System (HMTDIS) is the upgraded version of the production-run Sura HMTDS offering the new advantage: it displays aiming and flight information in the pilot's field of view.

The HMTDIS receives signals from the airborne system and generates the indicative marks (symbols, alphanumeric information) displayed in the pilot's field of view.

The type and volume of the displayed data will be specified with the Customer.

The data display field of view: 6x4°.

The production-run Sura HMTDIS upgrade is fulfilled by changing a helmet unit and two boards in the electronic module.

The production-run helmet unit and the new one are identical by form, weight, dimensions, docking, mechanical and electric parameters.

The upgrade can be performed in the exploitation places directly.

The warranty lifetime of the HMTDS is extended due to upgrade.



## ARMAMENTS

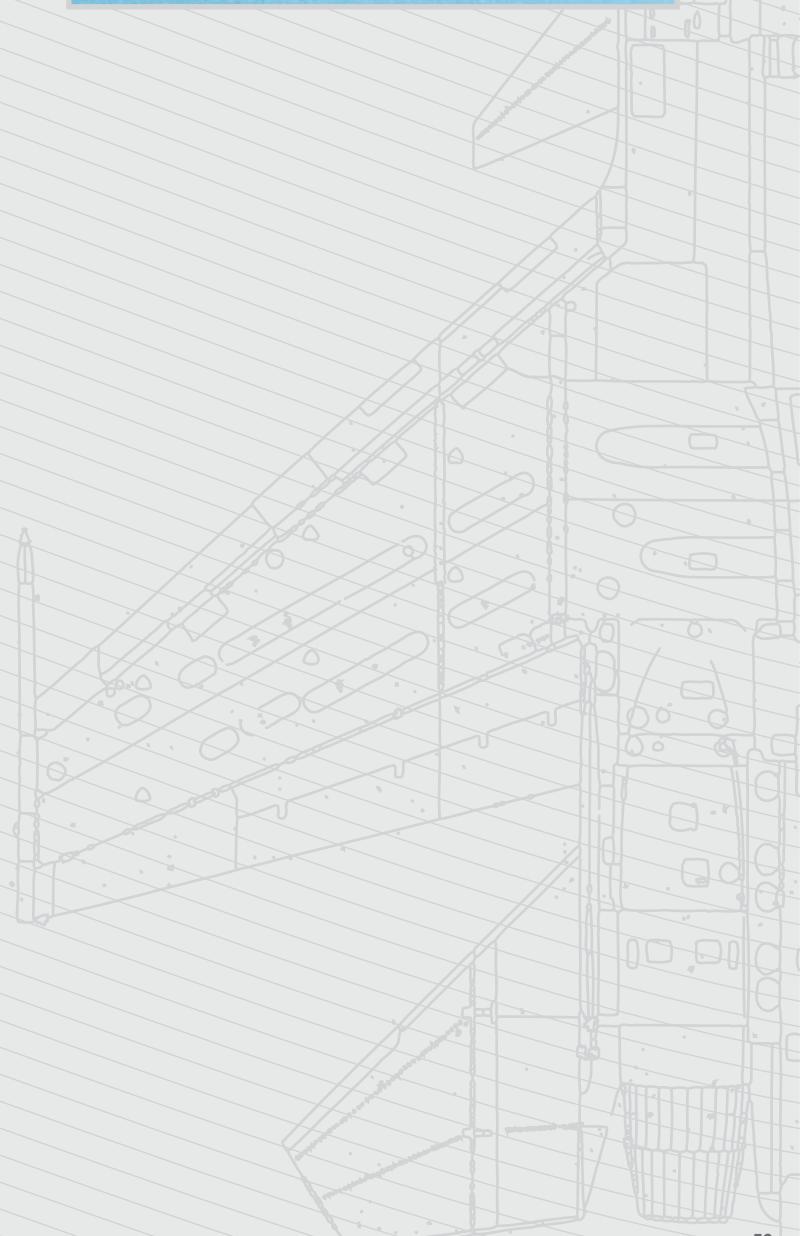
### Glider Pylons

БДЗ-УСК-Б bomb rack (girder pylon) designed for suspension, deliver and ejection release 80...500 kg stores having twin suspension lugs at 250 mm centers. Fitted with an Ejector Release Unit ДЗ-УМ. The Rack has nose and tail fairings for aerodynamic improvement. There are four sway braces with adjusting pads. Used at Su-24 and Su-27 aircrafts.

БДЗ-60-21УМР, БДЗ-60-21Д1, БДЗ-60-21Р1, БДЗ-60-23Ф1, БДЗ-60-23К1, БДЗ-60-23МП glider pylons are used at MiG family aircraft and are intended for suspension and dropping of launchers, blocks, girder holders with several locks, cargoes from 50 to 500 Kg and 3Б-500 incendiary block

#### Technical data Girder Pylons BD3-60 series

Operational Voltage, V	27( $\pm 10\%$ )
Overall dimensions, mm	1652x245x410
Mass, kg, not more	39,1





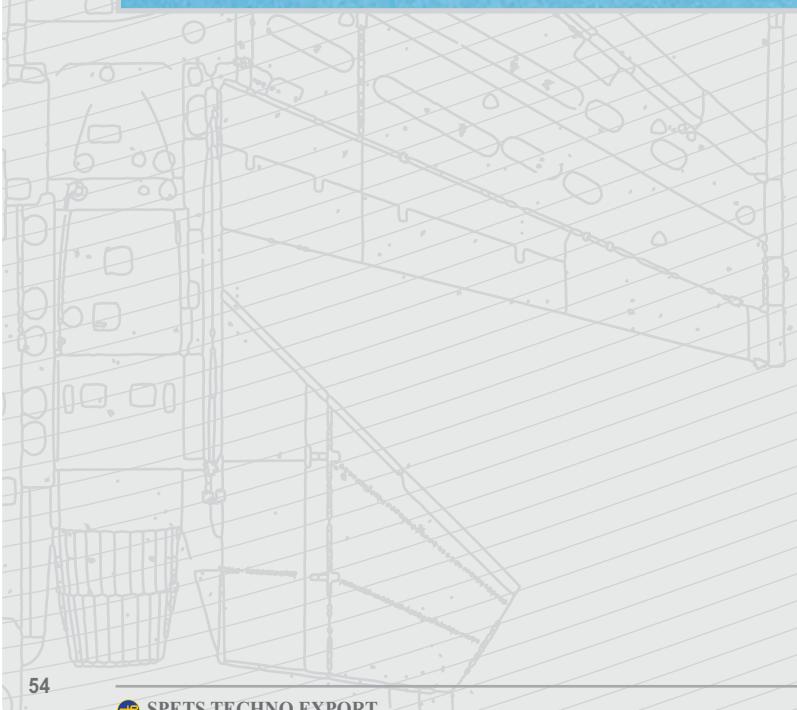
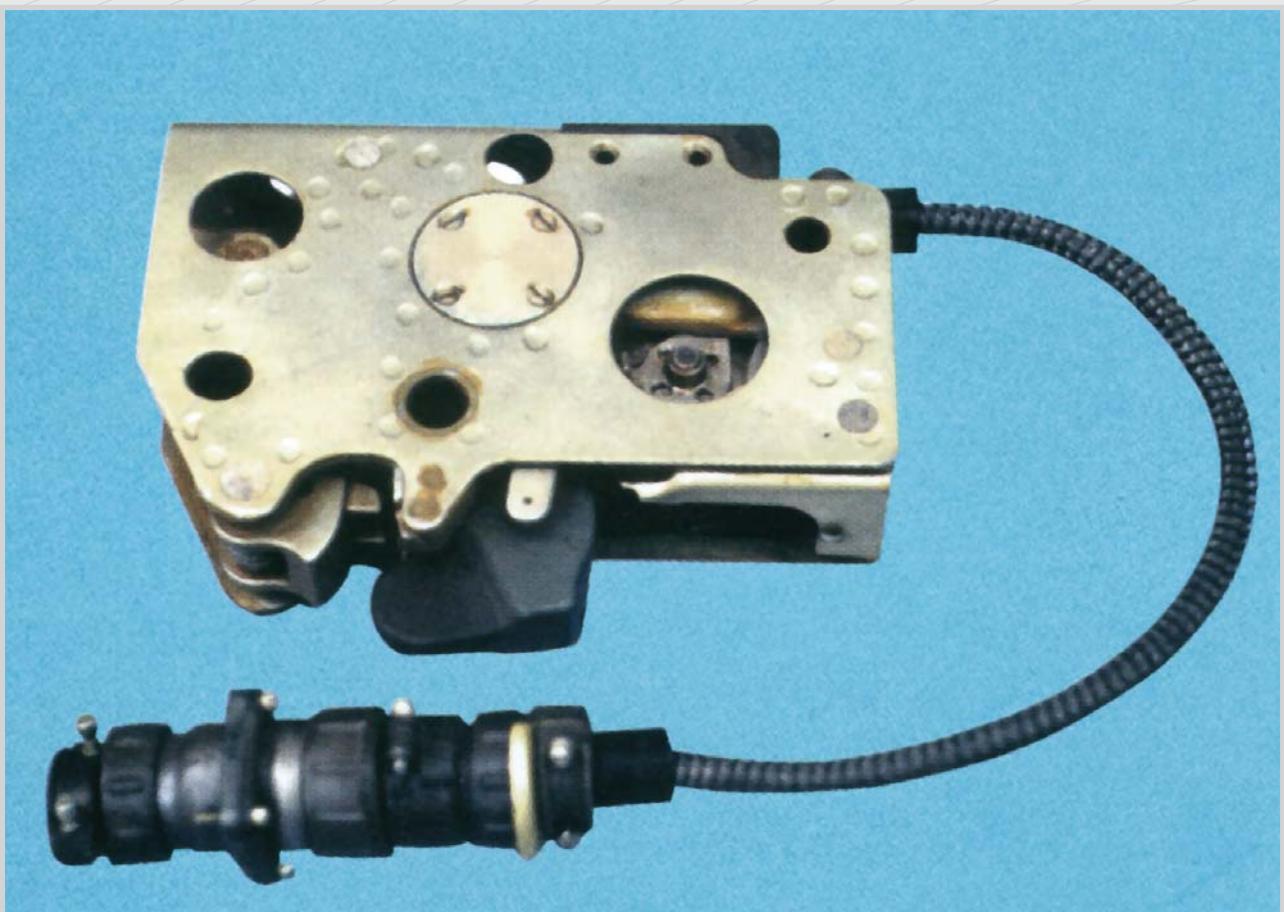
## ARMAMENTS

### Girder holders BD3-56E, BD3-56EM

АПУ-470 rail launcher is designed to provide suspension, delivery and launch of the missiles from the aircraft. It consists of the body with front and rear suspension points, guide rail, connectors with joining mechanism united in functional unit, components of the electric circuits, waveguide channel and nitrogen supply for cooling the missile infrared homing head.

Standard armament on Su-27 and MiG-29 aircrafts.

АПУ-68У, АПУ-68УЭ, АПУ-68УМ3, АПУ-68-85, АПУ-68-85Э are intended for suspension, transportation and launching of missiles at SU, MiG and YAK aircraft





## ARMAMENTS

### Airborne Launchers

АПУ-470 rail launcher is designed to provide suspension, delivery and launch of the missiles from the aircraft. It consists of the body with front and rear suspension points, guide rail, connectors with joining mechanism united in functional unit, components of the electric circuits, waveguide channel and nitrogen supply for cooling the missile infrared homing head.

Standard armament on Su-27 and MiG-29 aircrafts.

АПУ-68У, АПУ-68УЭ, АПУ-68УМ3, АПУ-68-85, АПУ-68-85Э are intended for suspension, transportation and launching of missiles at SU, MiG and YAK aircraft.



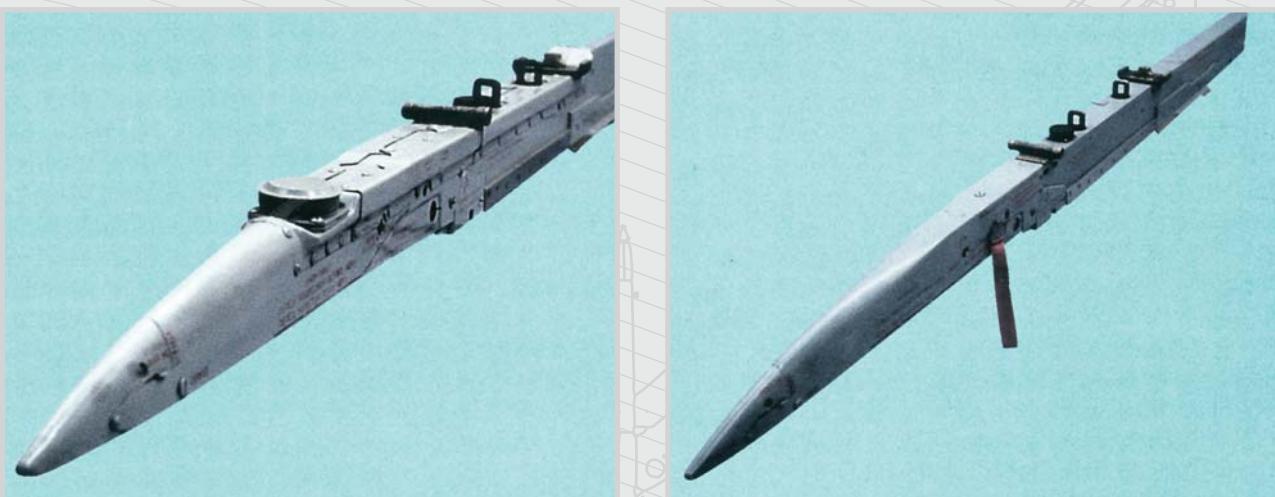
#### Technical data

Quantity of suspended missiles,	pcs 1
Force of missile separation from launcher, N	$3676 \pm 490$
Holding force of lock when the stopper mechanism is closed, N	11760

Force of tightening of launcher to girder holder by every bolt, N

Triggering voltage, V

$27(\pm 10\%)$





## ARMAMENTS

### «ADROS» BAU-01K Aerodynamic guidance section for bombs

BAU-01K aerodynamic guidance section is used to increase the effectiveness of aviation bombs combat application against stationary and low-dimension targets. It is designed for bombs of 200 lb ( $\approx 100$  kg), 500 lb ( $\approx 250$  kg) and 1000 lb ( $\approx 500$  kg) caliber.

#### Mission:

- Bomb hit accuracy increasing
- Fast conversion of conventional bombs to correction
- Planes/Flights/Bombs reduction for stationary low-dimension targets hitting
- Platform (base) for different guidance systems

#### Features:

- Application on 200, 500 and 1000 lb bombs.
- Combined guidance system (GPS + inertial).
- Two pairs of control surfaces (canards) for bomb flight control on calculated trajectory movement.

- Possibility for other types of guidance system use (TV(CCD), IIR, inertial, etc.).
- Target hitting accuracy is comparable with value for specialized correction aviation bombs.

#### Specifications:

- Applicable altitude – from 500 to 6000 m
- Readiness time – not more than 3 s
- Continuous working time in autonomous flight – not less than 60 s
- Guidance system onboard continuous working time – 4 hours
- Power supply – DC: 5 V and 27 V
- Operating condition:
  - Temperature – from -50°C to +70°C;
  - Pressure – up to 15 mm Hg;
  - Altitude drop – up to 9000 m;
  - Humidity – up to 98% at +35°C
- Weight – depends on design solution (up to 10 kg).

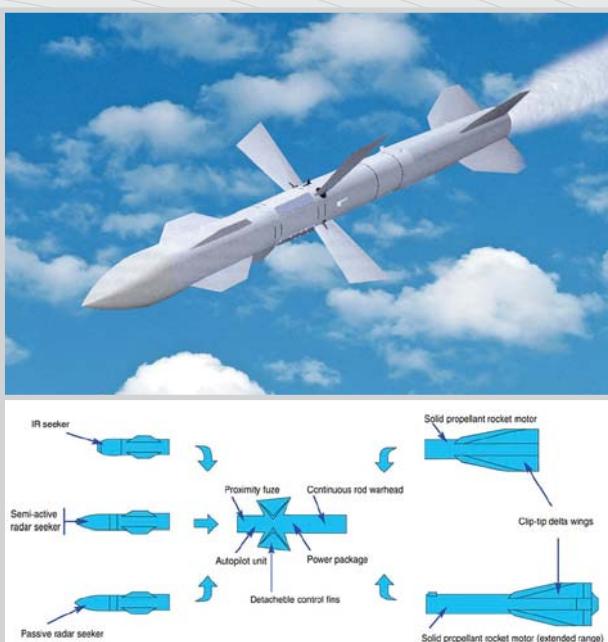




## ARMAMENTS

### R-27 A medium range, guided air-to-air missile

The R-27 is a medium range, guided air-to-air missile. It is designed to intercept and destroy hostile piloted aircraft, drone targets and cruise missiles in long-range and close-in maneuverable air fight. It features a three-modular construction that incorporates the equipment and guidance unit with a homing head, warhead, solid-propellant rocket motor and three hard points. It is compatible with the MiG and SU aircraft weapon systems.



#### DUMMIES MANUFACTURED BY ARTEM COMPANY FOR TRAINING PURPOSES:

R-27R1 UD

R-27T1 UD

R-27ER1 UD

R-27ET1 UD

Operational rounds are designed for training of maintenance personnel to verify missile parameters using automatic test equipment. The round comprises equipment unit, inert warhead and rocket motor assembly.

R-27ER1 UR

R-27R1 UR

R-27T1 UR

R-27ET1 UR

Cross-section training rounds are designed to study missile structure by operator's personnel in training centers.

#### R-27UT-RT

Acquisition training round is a practice record variant of R-27 missiles. It is equipped with the instrumentation unit that simulates generation and passage of basic control commands to the platform and is used for sighting simulation under captive carry flights when training pilots.

#### SPECIFICATIONS

Type of missile	R-27ER1	R-27R1	R-27ET1	R-27T1
Launch weight, kg	350	253	343	245
Length, m	4,7	4	4,5	3,7
Body diameter, m		0,23		
Motor diameter, m	0,26	0,23	0,26	0,23
Wing Span, m	0,8	0,77	0,8	0,77
Control surface span, m		0,97		
Launch altitude, km	to 27	to 25	to 30	to 24
Launch range, km				
a) Max. head-on aspect	95	60	90	60
b) Min. tail aspect	0,5	0,5	0,5	0,5
Maximum g-load	8	8	8	8
Weight of warhead, kg / td >		39		
Guidance	Semi-active radar seeker with command updates		IR seeker	



## ARMAMENTS

### BAR'ER-V Helicopter antitank missile system



#### PURPOSE

BAR'ER-V helicopter antitank missile system for MI-24 helicopters modernization consists of the antitank guided missile (ATGM) in a transport-launching container (TLC) and laser control channel (LCC) in an optic-aiming station (OAS-V) and is designed to destroy stationary and moving modern armoured targets with combined, carried or monolithic armour including ERA (explosive reactive armour) and also pinpoint targets like weapon emplacement, a tank in a trench, light-armoured objects and helicopters.

#### SPECIFICATIONS

Maximum range, m	7500
Guidance system	automatic by laser beam with television-thermal imaging autotracking of a target
Weight, kg: - missile in container	43
Overall dimensions, mm: - missile calibre	130
- container length	1917
Warhead type:	tandem hollow-charge
Armour penetration, mm	no less than 800
ERA penetration	is assured
Target hit probability by one missile	0,7 - 0,85



## ARMAMENTS

### AR-8 Aircraft unguided missile



#### PURPOSE

AR-8 aircraft unguided missile (AR-8 AUGM) is intended for firing from launching units B8M and B8V20 included in the non-guided rocket armament of aircrafts like SU-17, SU-24, SU-25, SU-27, MiG-23, MiG-27, MiG-29 and helicopters like Mi-24, Mi-28, Mi-8, and for destruction of different types of ground-based targets (tanks, APC, self-propelled artillery launchers, missile launchers, radar stations, aircrafts on the ground, ammunition depots, special trains, soldiers).

#### SPECIFICATIONS

Calibre, mm	80
Missile length, mm	1586
Missile weight, kg	12,5
Warhead weight, kg	4,3
Warhead type	hollow-charge and fragmentation
Damage effect:	
- armour penetration, mm	no less than 400
- amount of debris	no less than 500
Range, m	1200 – 4000



## ARMAMENTS

### AR-8L Corrected air missile



#### PURPOSE

AR-8L corrected air missile is intended for firing from launching units B8M and B8V20 included in the corrected rocket armament of aircrafts like SU-17, SU-24 (with equipment "Klyon"), SU-24M, SU-25, MiG-27K, and also helicopters with target laser illumination system, and for destruction of different types of ground-based targets (tanks, APC, self-propelled artillery launchers, missile launchers, radar stations, aircrafts on the ground, ammunition depots, special trains).

#### SPECIFICATIONS

Calibre, mm	80
Missile length, mm	1725
Missile weight, kg	14,7
Warhead weight, kg	4,3
Warhead type	hollow-charge and fragmentation
Damage effect: - armour penetration, mm	no less than 400
- amount of debris	no less than 500
Range, m	1200 – 4000





## ARMAMENTS

### ALTA Guided missile with RF seeker



#### SPECIFICATIONS

Target types (moving, stationary)	tank, APC, helicopter, launch boat, missile systems, radar station etc.
Carrier types	APC, ICV, helicopter, launch boat
Guidance system	combined: on the initial point – guidance by the laser beam; on the final point – homing guidance by means of the active seeker
Maximum range, km	11,5
Weight, kg	
- missile in container	70
- missile	55
Container length, mm	2000
Rate of fire per minute	2
Warhead type	tandem hollow-charge and fragmentation
Armour penetration, behind ERA, mm	no less than 1200
Hit probability by 1 missile	0.9



## ARMAMENTS

### CORRECTED AIR BOMB



#### PURPOSE

The bomb is intended for destruction of the ground-based targets like railway bridges, concrete constructions, runways, radar stations, positions of operative and tactical missiles, antiaircraft missile systems and also of the above-water targets at the level flight, diving and pulling-up of the aircraft with "fire-and-forget" system. It is equipped with a television seeker which ensures the targets locking-in under the aircraft and automatic guidance at the autonomy flight.

#### SPECIFICATIONS

Operational range, km:	
- at the altitude of 0.5 km	till 8
- at the altitude of 5 km	till 20

Target aiming accuracy (all-round probable deviation), m	3 - 5
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Aircraft velocity while firing, m/s	200 - 300
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Diameter, mm	400
--------------	-----

Weight, kg	850
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Warhead weight, kg	650
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Warhead type	high-explosive
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Type of suspension bracket	AKU-58
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## ARMAMENTS

### GUIDED AIR-TO-AIR MISSILE OF CLOSE AIR COMBAT



#### PURPOSE

High manoeuvrable guided air-to-air missile of the close air combat with infra-red homing head, non-contact radar target sensor in the millimeter range and controllable vector of the engine traction is intended for interception and destruction of the high manoeuvrable means of aerial attack and reconnaissance under conditions of attack:

- at any time of twenty-four hours;
- into forward and backward semispheres of the targets;
- against ground, sky and water surface backgrounds;
- under the ordinary and complex weather conditions;
- with active informational and manoeuvrable counteraction of the enemy.

Missile is intended for use in the armament systems of the fighters, front bombers and low-flying attack aircrafts.

#### SPECIFICATIONS

Carrier altitude, m	20 - 20000
Target altitude, m	20 - 20000

Carrier speed, km/h	650 - 2500
Target speed, km/h	not more than 2700

Correlation of carrier and target speeds	0,8 - 3,0
--	-----------

Target overload, g	0 - 12
Location of the target above (under) the carrier, m	0 - 5000
Angles of the target designation, ...°	±60

Maximum launch range under conditions of attack :	
- into the backward semisphere, km	up to 20,0
- into the forward semisphere, km	up to 40,0
- into the side aspect angles, km	up to 15,0

Minimum launch range under conditions of attack :	
- into the backward semisphere, km	0,3
- into the forward semisphere, km	0,65
- into the side aspect angles, km	0,6

Time of the controlled flight, s	up to 25
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## ARMAMENTS

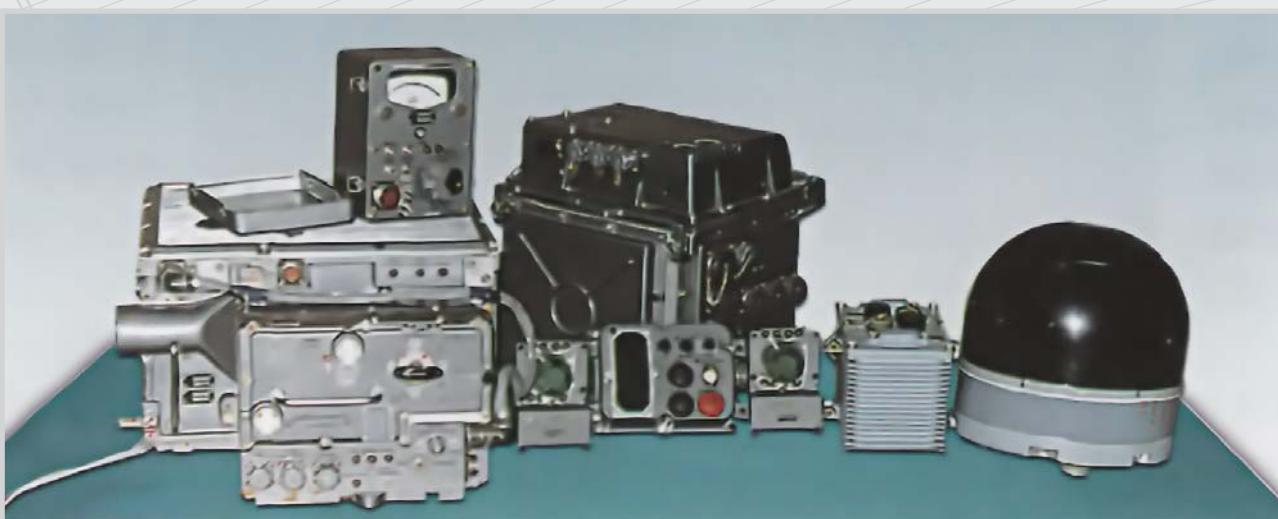
### «SHTURM-V» ANTITANK MISSILE COMPLEX

#### DATA TRANSMITION EQUIPMENT 9S477 (MI-24/25/35 helicopter)

Designed to convert voltage drives into coded transfer them to the controlled object on-board pulse commands and equipment.

#### Technical Characteristics:

Pulse power, kW, not less than	2.8	Radio command path frequency, Hz	$240 \pm 4$
Maximum aiming error, m, not more than	4	Radio command pulse length, mc sec	$45 \pm 0.1$
Antenna transfer speed, deg/sec, not less than:			
horizontal		20	
vertical		10	
Supply voltage, V:			
AC		$115 \pm 5$ ;	
400 Hz; three-phase			
DC		$6 \pm 1.8$	
$27 \pm 2.7$			
Time ready, sec	$210 \pm 20$	Weight, kg, not more	120
Command transfer time, sec, not more than	$20 \pm 1.5$		





## ARMAMENTS

### AIRCRAFT RESCUE CONTAINER

#### PURPOSE

Exact delivery of effective load to the out-of-the-way places:

- life saving equipment;
- fire-extinguishing means;
- other loads.

It can be applied from aircrafts of all types with the beam-type holder of BDZ - USK type.



#### MAIN SPECIFICATIONS OF THE AIRCRAFT RESCUE CONTAINER

Variants of construction



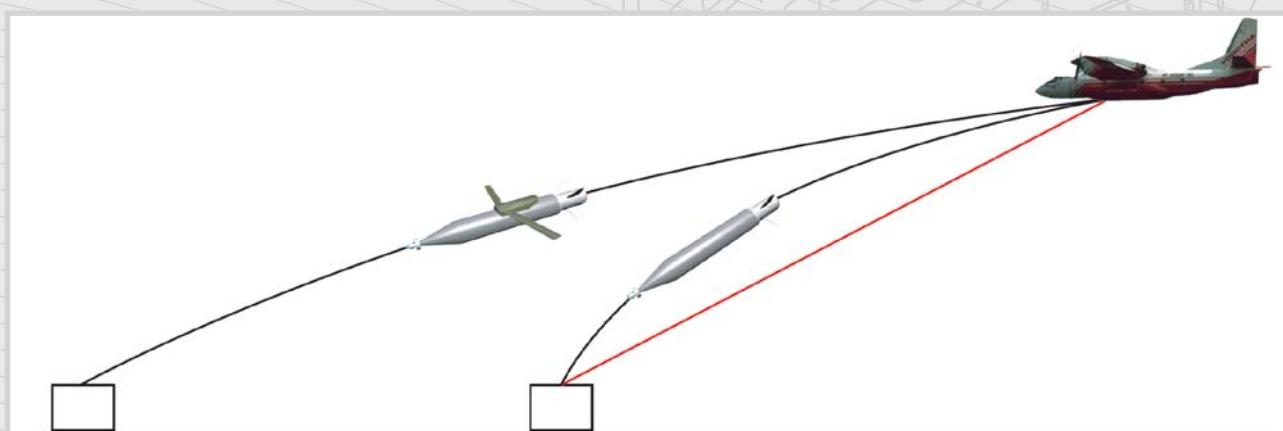
Specifications:

Maximum operating range, km	7...9	up to 40
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Launching weight, kg	450	500
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Payload weight, kg	250	250
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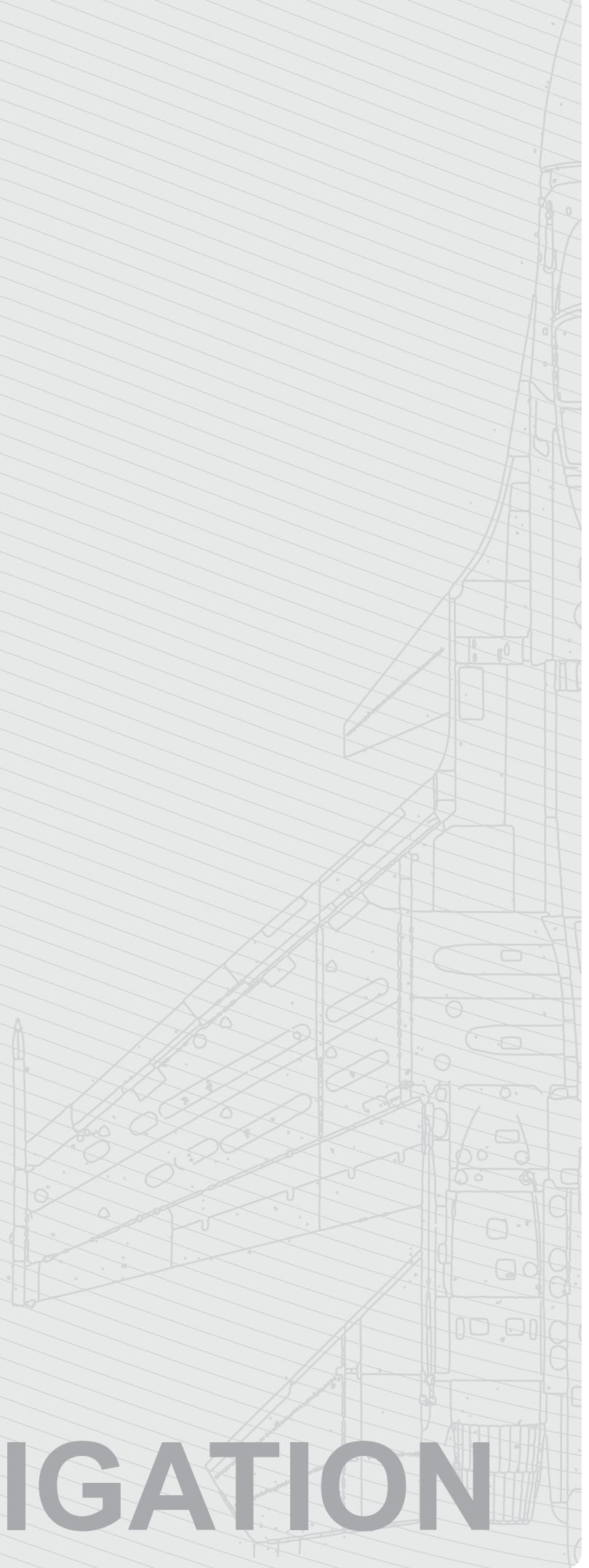
Guidance system	laser semi active	inertial and satellite
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**NEW** TIME  
TECHNOLOGY





# NAVIGATION



## NAVIGATION

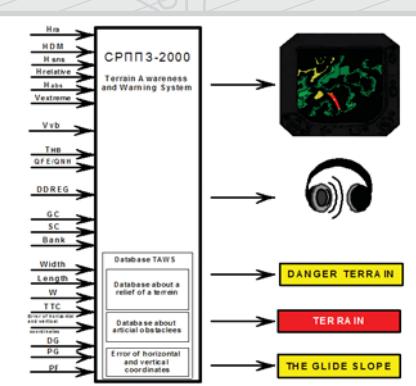
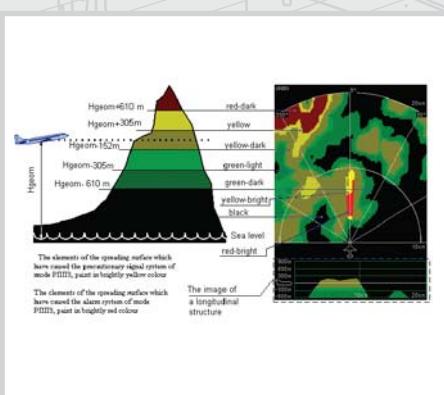
### СРППЗ-2000 TERRAIN AWARENESS AND WARNING SYSTEM

The СРППЗ-2000 system is intended to precautionary speech and visual signal information of the aircraft crew about terrain or water surface approach also for increase in awareness of crew AV about elements of a terrestrial surface and/or the artificial obstacles available in a database of system СРППЗ-2000 and representing potential danger on its operating or predicted.

Besides, system СРППЗ-2000 indicates and signals about passing predetermined fixed heights, exceeding admissible roll angle value, premature

decrease at landing approach. The functioning algorithm of the system contains criteria of danger and considers the set configuration. Signal information is formed in advance to provide the crew with sufficient time for appropriate performance.

On the basis of current parameters of the flight, position the landing gears and flaps, surface relief and artificial obstacles the system continuously analyzes flying conditions and alarms potentially dangerous situation.



**The illustration  
of a principle  
of work  
of system  
СРППЗ-2000**





## NAVIGATION

### СРППЗ-2000 TERRAIN AWARENESS AND WARNING SYSTEM

#### Main technical characteristics:

System readiness time, not more than	10 sec
Time of continuous work, not less than	24 h
Time between failures	10 000 h
Weight of system, not more than, including:	2,4 kg
- СРППЗ-2000, not more than	1,6 kg
- FRAME of СРППЗ-2000, not more than	0,8 kg
Overall dimensions:	
- width	33 mm
- depth	435 mm
- height	222 mm

#### Operating ranges:

Sinusoidal vibrations	range of frequencies from 5 - 2000Hz, amplitude of vibroacceleration up to 5 g, amplitude of vibrodisplacement 2,5 mm;
Shock loading	up to 6,0 g;
Linear acceleration	up to 5,0 g;
Atmospheric pressure	from 12 up to 170 kPa (from 90 up to 1270 mm.merc.col.);
Operating temperatures	+ 55°C / - 55°C
The short-term working temperature	+ 70°C
Limited temperatures	+ 85°C / - 60°C
Relative humidity	not more than 96 % at up to 40°C
Lightning resistance and HIRF	Connection cables should be placed in shielding braid, connected to both ends with case AV

## MMW COLLISION AVOIDANCE RADAR (CAR)

The CAR is intended for operation as a component of the helicopter radar for all-day and all-weather collision avoidance of a helicopter with stationary obstacles such as supports and high-voltage power lines, towers, high buildings, etc.

The CAR can be used for a short-range navigation of ships in severe weather conditions, as well as for anti-mine and anti-diversionship defense.

#### Basic performance data:

Operating frequency band	millimeter
Working measuring zone:	
- in distance	45 - 2200 m

- in azimuth	± 60 degrees
- in elevation	± 15 degrees
Resolution:	
- in distance –	7.5 . . . 10 m
- in angular coordinates	1° ± 0.1°

Mean-square error in angular coordinate measurement	0.5 degree
Operating temperature range minus	50°C...+55°C;
Weight	20 kg



## NAVIGATION

### «BURAN A-140», «BUBAN-A» AIRBORNE METEO-NAVIGATION RADAR STATION

Airborne meteo-navigation radar station «BURAN A-140» is installed on AN-140 aircrafts, and «BURAN-A» in various modifications, on AN-148, AN-38, AN-74TK-300, IL-114 aircrafts as well as on the BE-200 seaplane.

#### **Advantages:**

- absence of waveguide channel facilitates installation and maintenance of the aircraft;
- possibility of interfacing with the TCAS system and satellite navigation system allows minimizing the equipment composition;
- dialogue mode of control and automated adjustment facilitates the work of a pilot;

- automatic processing and tuning of the «image»;
- electronic sight for measurement of the meteorological object and radiolocation reference points coordinates;
- detection of turbulence zones;
- compensation of the radio-waves attenuation in the meteorological formations;
- reflection and analysis of the vertical profile of the meteorological objects;
- location of the oncoming aircrafts;
- navigation in-flight view of the underlying surface.

#### Complete set description and reference characteristics:

Structure	Modifications for aircrafts					Weight, kg	Overall dimensions, mm
	AN-140	AN-38	AN-74TK-300	BE-200	IL-114		
Antenna transmit-receive unit (ATR)							
BR702	+	-	+	+	+	12,7	304 x 250x 130
BR701	-	+	-	-	-	11,7	224 x 250 x 13 VSAR 377x244
Control unit							
BR483	-	-	+	+	+	1,5	80 x 120 x 200
Multifunctional Indicator							
BR457	-	-	-	-	-	6,9	71 x 158 x 160
BR454	+	+	-	-	-		

Carrier frequency, MHz

9345

Power supply:

Pulse power, kW

5

70 W; 1,5 A

Beam width, degree

4x4/6x10

80 VA; 0,7 A

Antenna gain, decibel, dB

33/27



## NAVIGATION

### PNS-24H SIGHTING-NAVIGATION SYSTEM

Sighting-navigation system PNS-24M is installed on SU-24M aircraft and provides at any time of day and night in simple and difficult meteorological conditions solution of following complex tasks:

- automatic flight as per set programmed and strategically itinerary points with correction of current position;
- detection of objects and aimed pointing of all kinds of aviation armament on terrestrial (hidden and open), airborne and above-water targets;
- safe fly-around at the altitudes from 50 to 600 m automatic and semi-automatic modes.

Construction of the system comprises 16 separate functional units.

#### Main technical characteristics

Supply voltage:

- three-phase, V, Hz 200, 400;

- DC, V 27;

Power consumption, VA, not more than:

- over circuits 200 V, 400 Hz 7800;

- over circuit 27V- 3100 W;

Weight, kg, not more than 837

### «OSMINOG PS» AND «OSMINOG PS-32» Radar stations

«OSMINOG PS» radar station is installed in KA-27 helicopter and designed for search and rescue, as well as for navigation purpose. «OSMINOG PS-32» radar station is installed in KA-32S helicopter and designed for panoramic observation of water and terres-

trial surfaces, searching, detection and coordinates determination of surface objects, estimation of general ice conditions, navigational purpose, and detection of deep cumulus cloudiness.

#### Main technical characteristics:

Detection range of surface objects from 100-500 m flight altitude with sea state up to 3:

- with average ERA 250 m<sup>2</sup> not less than 25 km
- equipped with transponder-beacons

from 20 to 100 km

(subject to beacon type, for «OSMINOG PS»)

10 W from the airborne circuit = 27 V

not less than 30 km

(for "OSMINOG PS-32" station)

Object coordinates determination error, not more than:

- |                        |      |
|------------------------|------|
| • for range            | 50 m |
| • for relative bearing | 1,5° |

Weight of equipment:

- |                   |                      |
|-------------------|----------------------|
| • «OSMINOG PS»    | not more than 120 kg |
| • «OSMINOG PS-32» | not more than 150 kg |



## NAVIGATION

### «KURS-93M» AIRBORNE INTEGRATED NAVIGATION\_LANDING SYSTEM

«KURS-93M» is a new generation of domestic navigation-landing equipment, developed on the basis of single-chip microcomputers.

By its technical and operational characteristics «KURS-93M» fully corresponds to the ICAO requirements. This equipment can be used on any types of aircrafts and helicopters without any restrictions. Currently it is installed on AN-140, AN-38, MIG-29 aircrafts, MI-8 helicopters as well as on other aircrafts.

The system provides for navigation of the aircrafts flights by radio beacons of VOR system, pre-landing maneuvers and approach landing by ILS and SP-50 radio beacons, as well as marker radio beacons flyby signaling.

The system comprises radio receiving block on shock frame and control panel.

#### Main technical characteristics:

##### Radio receiving block (RRB)

Overall dimensions of the RRB -200 x 94,5 x 368 mm (1,5 K) (without frame)

• Weight of the RRB	4,7 kg (without frame)
• Weight with the frame	6,3 kg
• RRB power consumption	30 W from the airborne circuit =27 V
• Ventilator feed from the airborne circuit	115V, 400 Hz

Code of external influences of the RRB mounted on the frame –

BVI/V, zone B, ground-U1-UL-DIII-TII\*-VLI-TMI-RO-PPI-PSKh-PG-VDKh-AShII.

\*RRB operating temperature range for:

• performance I	from minus 55° C up to plus 55°
• performance II	from minus 40° C up to plus 55°

##### Control panel (CP):

• CP overall dimensions	1450
• CP weight	155x48x145 mm
• CP power consumption	1 kg

10 W from the airborne circuit = 27 V

Code of external influences of the CP –

BIV, zone A1, ground U1-UL-DRIII-TII\*-VLI-TMI-ROX-PPI-RS-PG-VDKh-AShII.

\*Operating temperature range:

from minus 55° C up to plus 60°





## NAVIGATION

### ТСД-10, ТСД-11 and ТСД-5М Board light-signal diode

Board light-signal diode ТСД-10, ТСД-11 and ТСД-5М (red, yellow, green, white, blue colour of a luminescence) are intended for maintenance onboard the emergency, warning and notifying alarm system.

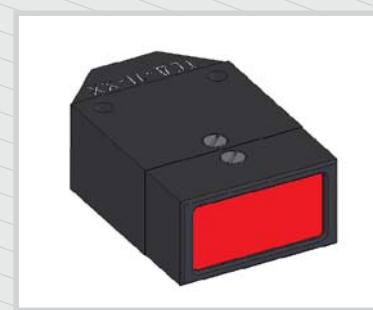
**Appointment of products is delivery of light signals in a kind:**

- Indicator fields ТСД-10 shone by certain color, ТСД-11 and ТСД-5М;
- Shone by certain color on indicator fields ТСД-10, ТСД-11 and ТСД-5М inscriptions, signs, images according to established in board a cliché.

The sizes of indicator field ТСД-10 allow to deduce the information in one line, ТСД-11 and ТСД-5М – in one or two lines.



Appearance ТСД-10



Appearance ТСД-11



Appearance ТСД-5М

The design of board ТСД-10, ТСД-11 and ТСД-5М provides information reading at external light exposure 61000 lux.

Executions of products ТСД-10, ТСД-11 and ТСД-5М have various kinds of connection of current-carrying wires – under the screw, under the soldering, under the screw inclined under 45°.

Boards ТСД-10, ТСД-11 and ТСД-5М are completely interchangeable from board ТС-10, ТС-11 and ТС-5М on incandescent lamps.

Parameters of board ТСД-10, ТСД-11 and ТСД-5М are specified in table 1.

**Table 1. Parameters of board ТСД-10, ТСД-11 and ТСД-5М**

The parametre name	Value of parametre		
	ТСД-10	ТСД-11	ТСД-5М
Supply voltage, DC or AC, V	27		
Consumption current, mA, no more		40	
Brightness of light signals, kd/m <sup>2</sup>		600-1800	
Uniformity of brightness of light signals, not less		1:3	
Colours of a light signal		red yellow green white blue	
The sizes of an indicator field, mm	47 x 5,5	24 x 12	24 x 12
Weight, kg, no more	0,028	0,024	0,028
Resource without replacement of light sources, hours, not less		10 000	
Range of working temperatures, °C	from a minus 60 up to 60		

Installation aboard air vessel ТСД-10, ТСД-11 and ТСД-5М provide:

- Decrease energy consumption the equipment;
- Increase of a resource of products;
- Increase of reliability of products.



## NAVIGATION

### РНЦ-1 The Digital Voltage Controller

The device is used for transformation of primary DC voltage 27 V to secondary DC voltage from 0 to 6 V and delivering it simultaneously on two independent channels. General view of the device is shown in figure 1.1.

#### Main technical characteristics:

- Supply voltage – from 18 to 33 VDC in accordance to p.8.1.5 ЕНЛГ-С and ГОСТ 19705-89;
- Quantity of independent output channels: two;
- Output voltage of each channel – from 0 to 6 V, changes in a range from  $(1,2\pm0,1)$  V to  $(6,0\pm0,1)$  V simultaneously on two channels by one handle of the device;
- Input supply current at nominal supply voltage 27 V at maximum load – not more than 2.0 A per each channel;
- Output (load) current of each channel – not more than 6 A;
- Power consumption from the 27 V line – not more than 1.5 W (without load power);
- Dimensions not more than 48x48x130 mm;
- Weight no more than 0,4 kg.

#### Operation conditions:

- vibration at frequencies from 5 to 2000 Hz with acceleration to 49 m/s<sup>2</sup> (5g) and displacement ampli-

tude not more than 2,5 mm;

- impacts with acceleration to 58,8 m/s<sup>2</sup> (6 g);
- linear acceleration to 5 g. For the mounting points to 10 g;
- decreased air pressure to 2,3 kPa (17 mm mercury column);
- highest operating ambient temperature 60 °C;
- lowest operating ambient temperature minus 60 °C
- relative humidity not more than 98 % at temperature 35 °C.



Figure 1.1

### AV-1SM AIRCRAFT STAR TRACKER

Automatic system AV-1SM is a part of strategic bomber Tu-160 navigation flight complex. System is meant for stellar monitoring of inertial navigation platform gyro drift by measuring stellar angular position relative to platform base control element.

AV-1SM system allows against the day background measuring angular coordinates of stars up to 4th magnitude in solid angle 100 degrees with

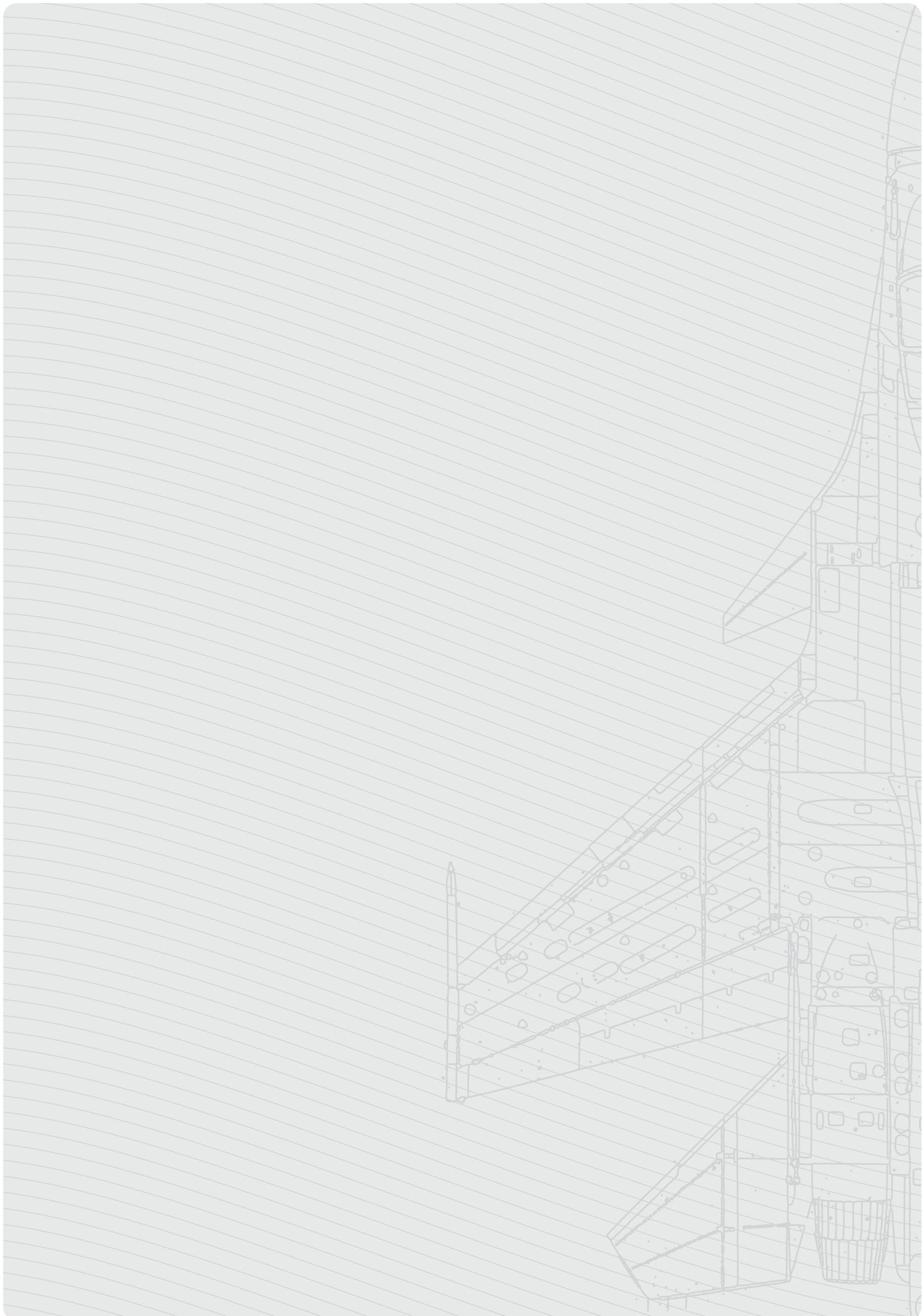
mean square error of 8 angular seconds. Stellar guidance and measuring angular coordinates of stars is fulfilled by means of biaxial orthodromic suspension with erection torque motors and induction angle-data transmitters on the axes. Stellar angular position detection is fulfilled in scanning mode by means of commands from airborne computer.

### HUD-77 ROOF-MOUNTED HEAD-UP DISPLAY

Head-up display is applied to display real-time flight and navigation information against out-the-cockpit background for the pilot (co-pilot) at the flight stages when active forward viewing is required. HUD-77 consists of optic-electrical block and on board equipment. Picture that pilots watch is formed by information of on board sensors transferred on HUD-77 through interface MIL-STD 1553.

#### Specifications

The main technical characteristics of HUD - 77  
 Instantaneous field of view  $\geq 20^\circ$  (V)  $\times 30^\circ$  (H)  
 Output data monochromatic green symbology  
 Display contrast  $\geq 0.2$  against a background 30000 cd/m<sup>2</sup>  
 Weight  $\leq 21.5$  kg



NEW TIME  
TECHNOLOGY



# AGGREGATES SYSTEMS SPARES

IN ADDITION OUR COMPANY IS READY TO SUPPLY A WIDE RANGE OF AGGREGATES,  
SYSTEMS AND SPARES FOR DIFFERENT TYPES OF AIRCRAFT, SPARES FOR DIFFERENT  
TYPES OF AIRCRAFT ENGINES/AGGREGATES



# AGGREGATES SYSTEMS. SPARES

## MIG AIRCRAFT FAMILY



	<b>MiG-21</b>	<b>MiG-23/23Б/УБ</b>	<b>MiG-25</b>	<b>MiG-27/27M</b>	<b>MiG-29/29UB</b>
<b>Fuel system</b> (centrifugal pumps, supporting and safety valves)	495Ф ДЦН-44С-ДТ1 ДЦН-64	1029 ГТН-7-3 ДЦН-76М/А	ГТН-7-3 ДЦН-44С-ДТ1	ДЦН-64 ДЦН-76А ДЦН-64А РД-20A РД-20A-2 РД-22 ЭЦН-14БМ ЭЦН-105	ГТН-7-3 ДЦН-78 ДЦН-80 РД-39 РД-41 ЭЦН-14БМ ЭЦН-14БМ 4030(A) fuel-oil unit
<b>Hydraulic system</b> (axial and plunger pumps, hydro drives)	495Б ДЦН-58А НП-70АМ-3 НП-27ТМ	495Б ДЦН-58А НП-96АМ-2 НП-70АМ-3	422А ДЦН-58А НП-96АМ-2 НП-70АМ-3	Д1А-1	Д1А-1 НС-58
<b>Power-supply system</b> (drive generators, batteries)	Д880Т DC electromotor МГП-700А МГП-700Б МГП-700Б-2С	МГП-180-2С МГП-200 МГП-700А МГП-700Б МГП-900 DC electromotor	МГП-180-2С МГП-700С-2С DC electromotor	Д880Т DC electromotor МГП-180В	Hydrovane drive ПГЛ 40-2(3) 15СЦС-45Б Ag-Zn battery
<b>Glazing products</b> (different types of glass)	E-6а	TСК-061 (TСК 061.00.000 ТУ) E-9		(TСК 061.00.000 ТУ)	
<b>Racks, launchers, locks etc.</b>	ДЗ-57Д lock ДЗ-57ДА lock	МБДЗ-У2Т-1/1М rack ДЗУ-1, ДЗУ-1М locks	МБДЗ-У2Т-1/1М multi-lock rack БДЗ-УМК2-Б rack	ДЗ-УМ lock	АПУ-470 launcher МБДЗ-У2Т-1/1М multi-lock rack БДЗ-УМК2-Б rack ДЗУ-1 lock ДЗУ-1М lock
<b>Air system</b>	АД-5А automatic pressure device				АД-5А automatic pressure device
<b>Control system</b>				ТДК capsule gas temperature detector ГП21-3 drive generator	



# AGGREGATES SYSTEMS. SPARES



## SU AIRCRAFT FAMILY

	<b>Su-24/24M</b>	<b>Su-25/25T</b>	<b>Su-27</b>	<b>Su-30/30MK/MKI</b>
<b>Fuel system</b> (centrifugal pumps, supporting and safety valves)	ГТН-7-3 ДЦН-64 ДЦН-72	1029 ДЦН44С-ДТ1	ГТН-7-3 ДЦН-80 ДЦН-80Т ДЦН-82	ГТН-7-3 ДЦН-80 ДЦН-80Т ДЦН-82
				НП-128 НП-160Д
	ЭЦН-14БМ ЭЦН-154А ЭЦН-335М ЭЦНГ-10С-76 ЭЦНГ-40 ЭЦН-45Б	ЭЦН-325 ЭЦН-75Б ЭЦН-91Б ЭЦН-91С ЭЦНГ-20С-62 ЭЦНГ-5	ЭЦН-14БМ ЭЦН-45Б ЭЦН-45С ЭЦН-91Б ЭЦН-91С ЭЦНГ-10	ЭЦН-45С ЭЦНГ-10 ЭЦНГ-40
				4030(A) fuel-oil unit
<b>Hydraulic system</b>	НП-96АМ-2 НП-96М НС-3 ГА213 ГМ40 Д1А-1	ДЦН-96	ГТН-6 НП-96М	НП-96М
			Д1А-1	
<b>Power-supply system</b> (generators, electro motors etc)	МГТ-750К2 ММТ-0,4АМ ММТ-1,5С/ ММТ-1,5С-ОМ AC electro motors МГП-180-2С МГП-180И2	ММТ-0,4А-2С ММТ-900 AC electro motors МГП-900 МП-100С-2С МП-100С-3С МП-50Б DC electro motors	МГП-180В МП-100С-2С МП-100С-3С МП-50Б DC electro motors	ГП25 Drive generator ММТ-1,5С/ ММТ-1,5С-ОМ AC electro motors
<b>Glazing products</b>		TCK 143.05.000 TCK-137 (TCK 137.03.000 ТУ)		
<b>Bomb racks, launchers, locks etc.</b>	МБД3-У6-68 multi-lock rack with ДЗ-57ДА locks	МБД3-У2Т-1/1М multi-lock rack  ДЗ-УМ lock	МБД3-У6-68 multi-lock rack	МБД3-У2Т-1/1М multi-lock rack  МБД3-У6-68 multi-lock rack
	БД4-УСКБ rack БД4-УСКМ-Б rack БД3-УСК rack		БД4-УСКБ rack БД4-УСКМ-Б rack БД3-УСК rack	БД4-УСКБ rack БД4-УСКМ-Б rack БД3-УСК rack
<b>Air system</b>		АД-5A automatic pressure device	АД-5 automatic pressure device	АД-5 automatic pressure device
<b>Control system</b>	HP01/1 hand hydraulic pump		ГП23-5 HP01/1 hand hydraulic pump ТДК capsule gas temperature detector	HP01/1 hand hydraulic pump ТДК capsule gas temperature detector



# AGGREGATES SYSTEMS. SPARES

## AN AIRCRAFT FAMILY



	An-26	An-32	An-140	An-74/An-74-TK200(300)	An-124-100
<b>Fuel sys- tem</b>	4673 463Б 463М  ЭЦН-14А ЭЦН-104В ЭЦН-11-А2 ДЦН-70А	4673 463Б  ЭЦН-11-А2 ЭЦН-14БМ  ДЦН-70А РД-20-2			
<b>Hydraulic system</b>	ЭМКО-М  ГА230-(2,-4) Throttle cock  ГА192/192Т Electromagnetic cock	НП-96АМ-2  ГА230-(2,-4) Throttle cock  ГА213 (T, H,-1-2-3-4) Reduction gear  HP32		ГМ40  ГА230-(2,-4) Throttle cock  ГА213 (T, H,-1-2-3-4) Reduction gear БПРП-1  НП-140 НС-140-2 НПТ-9	HC55А-5 HC62 HC63 HC53  ГА230-(2,-4) Throttle cock  ГА213 (T, H,-1-2-3-4) Reduction gear НП107 КГ 42 ГМ 56
<b>Power- supply system</b>	20НКБН-25(Д, Т, ТД, ТД-1)-У3 Ni-Cd battery  BC-1A Starter switch  MB-1000Б3 MB-280 MB-280-2С MB-280Б DC electro motors	20НКБН-25(Д, Т, ТД, ТД-1)-У3 Ni-Cd battery  MT-50 AC electromotor  MB-1000Б3 MB-280 MB-280-2С MB-280Б DC electro motors  МГП-180-2С МГП-180В DC electro motors	20НКБН-25(Д, Т, ТД, ТД-1)-У3 Ni-Cd battery  MT-50 AC electromotor  МП-50Б DC electromotor  ТПП76-115-400 ТПП124-115-400В ТПП55-115-400В	20НКБН-25(Д, Т, ТД, ТД-1)-У3 Ni-Cd battery  MT-50 AC electromotor  МП-50Б DC electromotor  ТПП206-115-400	20НКБН-25(Д, Т, ТД, ТД-1)-У3 Ni-Cd battery  ГП 23  МГП-0,12А DC electromotor
<b>Glazing products</b>	ТСБП-28 A-10	TCK-009 (TCK 009.04.000 ТУ)	TCK- 008 (TCK 008.00.000 ТУ)	TCK- 008 (TCK 008.00.000 ТУ)	TCK-006 (TCK 006.01.000 ТУ)
<b>Aircraft and power pack con- trol system</b>			HP9-35/B1		HP01/1 hand hydraulic pump  AYP-18





# AGGREGATES SYSTEMS. SPARES



## IL AIRCRAFT FAMILY

**Fuel system**
**IL-76**

ЭЦН-14М  
ЭЦН-11А2Ж  
НС-51А

**IL-78**

ДЦН-44СП3  
ДЦН-44СП3Т

АДТ-21МС

ДЦН-44СП3  
ДЦН-44СП3Т

**Hydraulic system**

РД-20А-2  
НС51А

ГА213

ГА213 (Т, Н,-1-2-3-4)  
Reduction gear

Д1А-1

ГА230-(2,-4)  
Throttle cock

**Power-supply system**

20НКБН-25(Д,Т,ТД,ТД-1)-У3  
Ni-Cd battery

ММТ-0,4АМ  
AC electromotor

МТ-3000-2С  
ММТ-0,4АМ  
МТ-25  
МТ-100  
AC electro motors

МГП-180-2С  
МГП-180В  
DC electromotor

Д1-0,08-0,32  
Д8-0,08-0,56

2Д202Д  
Diod

РПС1, РБН2, РД1(-1),  
plug/socket units  
РПС18/4, РПС32Б, РЭС10,  
РЭС15,  
РЭС34 мод., РЭС47, РЭС9  
relays

**Glazing products**

TCK 079M.01  
TCK 079M.02  
TCK 079M.05  
TCK 077M.03

**Aircraft and power pack control system**

HP01/1  
hand hydraulic pump



# AGGREGATES SYSTEMS. SPARES

## MI HELICOPTER FAMILY



	Mi-8 (АПС, МТ, МТВ-1)	Mi-17/171	Mi-24	Mi-25/35	Mi-26
<b>Fuel system</b>	АТП-8(А) НП-9  ЭЦН-40 ЭЦН-75Б ЭЦН-104В ЭЦН-89 ЭЦН-107СХ ЭЦН-91Б/С	ПЦР-1Ш  ЭЦН-40	ПЦР-1Ш  ЭЦН-40	4673 ПЦР-1Ш	
	ДЦН-70 ДЦН-70А	ДЦН-70 ДЦН-70А	ДЦН-70 ДЦН-70А	ДЦН-70 ДЦН-70А	
	ПЦР-1Ш	РД-22 safety valve	ЭЦНР-1А	ЭЦНР-1А	
<b>Hydraulic system</b>	НС74-2 ПНВ-2Б	НП27ТМ ПНВ-2Б	ЭМКО-К	ЭМКО-К	ГА215  ГА230-(2,-4) Throttle cock
	ГА230-(2,-4) Throttle cock	ГА230-(2,-4) Throttle cock			
	ГА192/2Т Electromagnetic cock	ГА192/2Т Electromagnetic cock			НС46(-2,3,5,6)
	ГА213 (T, H,-1-2-3-4) Reduction gear ГА215	ГА213 (T, H,-1-2-3-4) Reduction gear ГА215  ЭМКО-М			ГА213 (T,H,-1-2-3-4) Reduction gear
<b>Power-supply system</b>	20НКБН-25(Д, Т, ТД, ТД-1)-УЗ  Ni-Cd battery	20НКБН-25(Д, Т, ТД, ТД-1)-УЗ  Ni-Cd battery			Д-100С-3 DC electromotor
	Д-20-2 DC electromotor	Д-20-2 DC electromotor			
	МТ-3000-2С МТ-50  AC electromotor				
	МГП-180А МГП-180Б МГП-350Б-2С МП-100Б1-2С МП-100С МП-100С-2С МП-100С-3С МП-50Б Д-100С-3  DC electro motors	МГП-180Б МГП-350Б-2С МП-100Б1-2С МП-100С-2С МП-100С-3С МП-50Б Д-100С-3  DC electro motors	МГП-0,12А  МП-100Б1-2С МП-100С-2С МП-100С-3С  DC electro motors		МГП-350Б-2С МП-100С-2С МП-100С-3С МП-50Б  DC electro motors
	РПС1 РБН2 plug/socket units	РПС1 РБН2 plug/socket units			РПС1 РБН2 plug/socket units
<b>Glazing products</b>	В8БП		ТСБН-32 ТСК 030 ПС-5 windshield wiper drive		
<b>Aircraft and power pack control system</b>	HP9B HP-3A HP01/1  hand hydraulic pump ИМ-3А	HP-3A  hand hydraulic pump ИМ-3А	HP-3A		ИМ-3А



# AGGREGATES SYSTEMS. SPARES



## KA HELICOPTER FAMILY

	<b>Ka-25</b>	<b>Ka-27/28</b>	<b>Ka-29</b>	<b>Ka-31</b>	<b>Ka-32</b>
<b>Fuel system</b>	ДЦН-70А ЭЦН-75Б ЭЦН-104В	ДЦН-70А ЭЦН-75Б	ДЦН-70А ЭЦН-75Б	ДЦН-70 ДЦН-70А ЭЦН-75Б	463М ДЦН-70А ЭЦН-75Б
	РД-22 safety valve	РД-22 safety valve	РД-22 safety valve	РД-22 safety valve	РД-22 safety valve
<b>Hydraulic system</b>	ГА215	ГА215 НС46(-2,3,5,6)	ГА215 НС46(-2,3,5,6)	ГА215 НС46(-2,3,5,6)	ГА215 НС46(-2,3,5,6)
<b>Power-supply system</b>	МП-50Б Д-100С-3 DC electromotor	МП-50Б DC electromotor	МП-50Б DC electromotor	МП-50Б DC electromotor	РБН2 РПС1 plug/socket units
<b>Glazing products</b>					
<b>Aircraft and power pack control system</b>		HP-9В HP-3А (АК, АМ) ИМ-ЗА	HP-3А (АК, АМ)	HP-3А (АК, АМ) ИМ-ЗА	HP-9В





# GROUND TESTING EQUIPMENT



# GROUND TESTING EQUIPMENT SERVICE

## Multipurpose automatic control panel of aircraft engine electric equipment

Introduced to your attention control panel and adaptor wires for connection to exit interface connectors of AI-20, AI-25, AI-9B, TB2-117, TB3-117, AL-31F, RD-33, R-27F-300, R29-300, R13-300, R25-300, R-95Sh, R29, D-20KP, GTD-350 and other aircraft engines shall allow to control aircraft electric wiring harness of all types of aircrafts, helicopters, missiles and other objects while production, exploitation and maintenance.

Control panel is designed for controlling wiring harness with quantity of termination lugs up to 600, 1200, 1800, 2400, 3000 (as shown on photo) and 3600, depending on quantity of switching units.



# GROUND TESTING EQUIPMENT

## SERVICE



**Tester panel  
for diagnostic troubleshooting  
in on-board systems  
of electric appliances  
and avionics equipment  
of aircrafts and helicopters**

shall significantly simplify the process of complex defects searching in on-board systems of aircrafts, helicopters, missiles and other objects.

### **Multipurpose automatic control panel of aircraft of switching arrangements and cockpit panels**

Control panel and a set of multipurpose adaptor wires shall control the relay-switching boxes, on-board electro panels, panel boards, power distribution panels, cockpit panels etc, which require airborne voltage = 28 volt, ~115 volt 400 Hz, three-phase power line 36 volt 400 Hz, three-phase power line 200 volt 400 Hz for MiG, Su, Yak, Il, Tu, An, Be ranges of aircrafts and Mi and Ka ranges of helicopters.





# GROUND TESTING EQUIPMENT

## SERVICE

### **Modernization of portable unit 9.12 (hereinafter referred to as PU 9.12) for automatic diagnostics of on-board systems of MiG-29 aircraft**

PU 9.12 is designed for the conduction of automatic diagnostics of aircraft and engine systems, avionics and radio-communication equipment and armament systems of MiG-29 aircraft, detect faults up to construction plug-in, and conduction of adjustment after the replacement of plug-in.

Outdated and unreliable management system of PU 9.12 is based on micro computer "Electronika C5-22". Testing program is input by perforated tape: information for the operator will appear on photographic paper, outgoing information will be reflected on punch card. This causes great problems in case of necessity to amend working testing programs (in case of pro-

duction differences, or while introducing improvements, etc.) Due to this reasons there are long gaps in exploitation (out-of-service time) of PU 9.12.

#### **Modernization of unit includes:**

- replacement of outdated and unreliable management system by new one, based on state-of-the-industry computer, IBM PC-compatible;
- use of standard signal selectors and measuring devices, improvement of their performance by software means;
- saving the complex of testing operations, conducted by the unit, in full;
- simplicity of making amendments and additions to the testing programs based on conceptually new software;
- availability of working testing programs, instructions and operators' guidelines in language of Customer.



# GROUND TESTING EQUIPMENT

## SERVICE. «GURT-M» UNIVERSAL COMPLEX

Designed for preparation and maintenance of aircraft controlled weapons (all types of missiles and bombs)

### “GURT-M” SYSTEM

#### MEANS OF AUTOMATIC CONTROL (MAC)

##### GENERAL-PURPOSE EQUIPMENT



AKPA6.1M-05



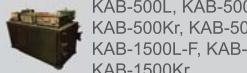
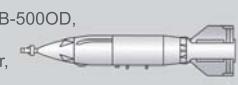
AKPA6.2M (AKPA6.2)

##### SPECIAL-PURPOSE EQUIPMENT

AKPA2.9M

Kh-59, Kh-59M,  
Kh-59MEAKPA2.13M  
(KDO)

R-73K, U-73, R-73L

AKPA2.20M  
(KDO)KAB-500L, KAB-500L-K, KAB-500OD,  
KAB-500Kr, KAB-500Kr-U,  
KAB-1500L-F, KAB-1500L-Pr,  
KAB-1500KrAKPA2.21M  
(KDO)R-27R1, R-27ER1, R-27T1,  
R-27ET1, R-27P, R-27EP,  
470UT-RT, 470UT-ERTAKPA6.4M  
(KDO)Kh-29T, IKh-29T, Kh-29TD,  
IKh-29TD, Kh-29L, IKh-29L  
S-25L, S-25LDAKPA6.7  
(KDO)

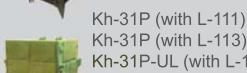
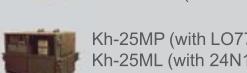
Kh-31A, Kh-31A-UD

AKPA6.11M  
(KDO)

R-60M, R-60MK



AKPA6.17

Kh-31P (with L-111), Kh-31P (with L-112),  
Kh-31P (with L-113),  
Kh-31P-UL (with L-111),  
Kh-31P-UL (with L-112), Kh-31P-UL (withAKPA6.18  
(KDO)Kh-25MP (with LO77M), Kh-25MP (with LO15M1),  
Kh-25ML (with 24N1), Kh-25MR (with V500),  
Kh-25MU (with LO77M), Kh-25MU (with LO15M1),  
Kh-25MU (with 24N1)

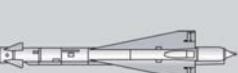
AKPA6.30



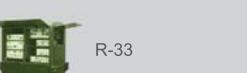
R-40T, UR-40T



AKPA6.31

R-40TD, R-40RD,  
R-40TD1, UR-40TD,  
UR-40RD

AKPA6.32



R-33



AKPA6.33



R-33S



#### MAINTENANCE FACILITIES

##### MANUFACTURING EQUIPMENT (ME)

Manufacturing  
equipment set  
№1 MS-14610GMultipurpose manufacturing  
equipment set MS-14603GSpecial-purpose sets for  
particular type of AKPA

##### AGGREGATES OF COMMON APPLICATION

TRUCK  
TRACTORDUAL -  
PURPOSE  
VEHICLETRUCK  
CRANEGAS-FILLING  
STATION

TRAILER

COMPRESSOR  
PLANTELECTRIC POWER  
STATION

Nowadays the Ukrainian Design Bureau is supplying the “GURT-M” system instead of the “GURT” system which has been manufactured since 1984 and delivered to more than 40 countries all over the world.

##### The modernized “GURT-M” system assures:

- check and preparation for application of more than 50 various modifications of air missiles and corrected air bombs;
- missile outgoing inspection on manufacturing plants;
- failure diagnosis while repairing missiles;
- forecasting of missiles technical state while prolonging their service life.

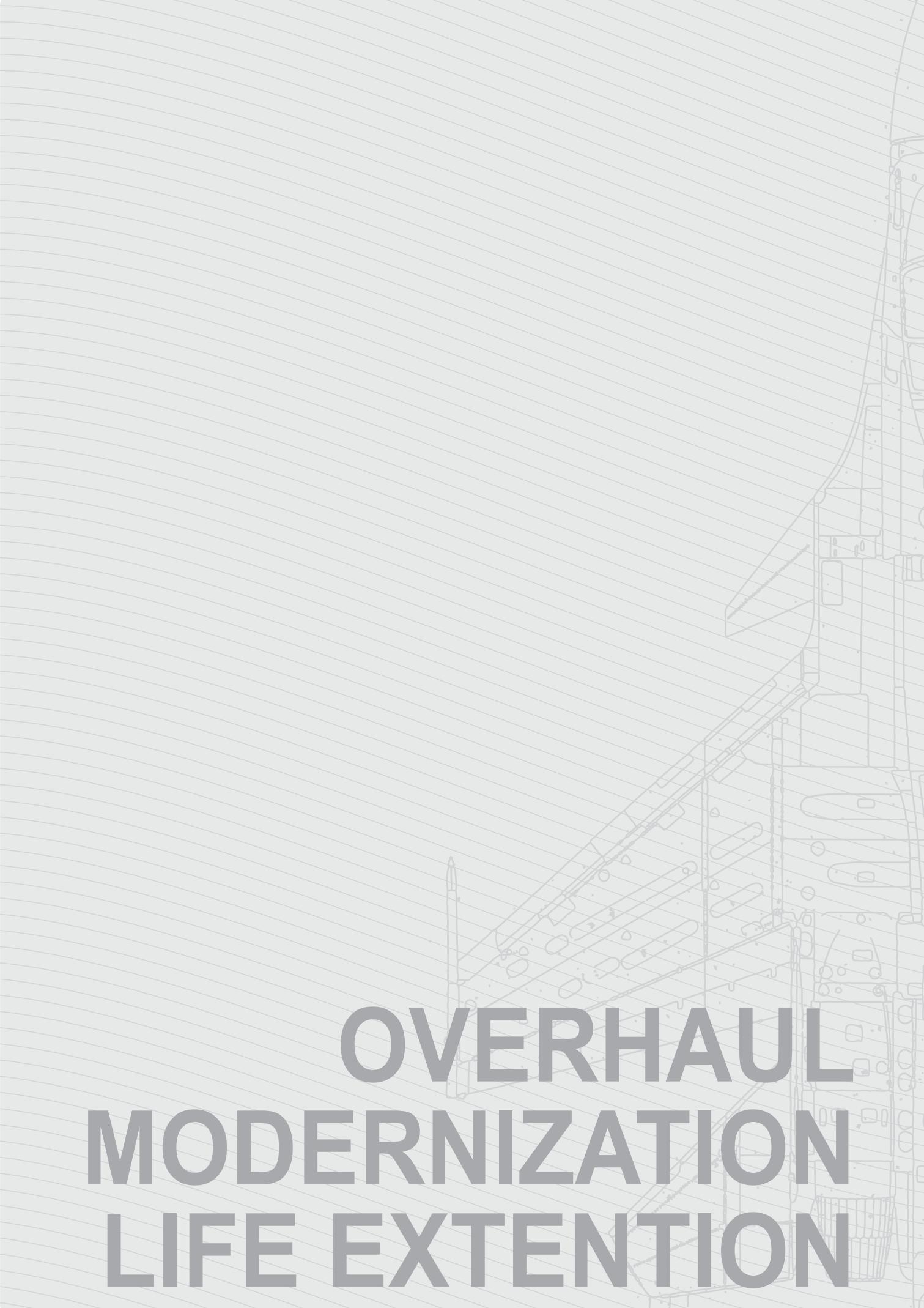
##### The advantages of the “GURT-M” system:

- overall and weight performances of AKPA are reduced;
- characteristics of operational reliability are improved, the mean time between failures is twice increased;
- up-to-date methods of visualization and documenting of the test results are introduced. The usage of the modern industrial computer has allowed documenting of the results in various languages, and also correcting of the check routines while operating;
- long-term storage of results of missiles testing for all the operation period is assured that allows forecasting of their technical state while prolonging their service life;
- in AKPA6.2M the power supply systems created on the basis of static transducers of heightened comfort (efficient, noiseless operation, convenient in maintenance) are applied;
- specialized equipment, in addition to AKPA, can also include diagnostic equipment sets (KDO) which allow failure pinpointing in the missiles for their repairing. The missiles that KDO are designed for are marked with red colour.

##### The list of services carried out by Ukrainian Design Bureau for the system:

- delivery of the “GURT-M” system in any kitting-up;
- modernization of the running “GURT” system into the “GURT-M” system. Modernization of AKPA6.1M is carried out by means of an extra equipment set delivery;
- extension of the assigned service life;
- repair and delivery of the spare parts.





# **OVERHAUL MODERNIZATION LIFE EXTENSION**



# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL AND MODERNISATION. AN FAMILIES' AIRCRAFTS

Total Technical Life Extension (TTLE) of An-32 Aircraft for granting life up to forty years as per program of SE «Antonov». TTLE is provided individually for each Aircraft upon fulfilment of the following conditions:

1. Modification of wing for strengthening of lower panels of wing centre section, examination and repair of hard-to-reach areas of structural elements.
2. Carrying out scheduled overhaul with periodicity of assigned TBO.
3. Carrying out individual Ageing Control Programs along with each overhaul and treatment of corroded areas using corrosion prevention material.

**Modernization of An32 Aircraft as per Customer's requirements foresees installation of new state-of-the-art equipment such as:**

- (a) Traffic Collision Avoidance System (equipped with RBS-type and "Mode S" transponders) along with replacement of RAM-700A with A-053.
- (b) Instead of available KURS-MP2 system a modern VOR / ILS system is installed.
- (c) GPS/GLONASS system with independent navigation console (with display), having facility for updating data and display the data to the repeater.
- (d) Replacement of Ground Proximity Warning System by Enhanced Ground Proximity Warning System. Additionally following devices are installed for improving operation features of the system:
  - Outside Air Temp Indicator P-104;
  - Altitude indicator UVK-1F along with MVP-1-1 air flow parameter module.
- (e) Distance Measuring Equipment with three indicators at Pilot, Co-pilot and Navigator's working places instead of existing SD-75.
- (f) Two modern VHF/UHF radio stations are installed with possibility to tune to maritime fre-

quency (156,8 MHz), having channel spacing of 8,33KHz.

(g) The existing radar system is replaced with up to date Weather radar system with two Multi-Function Indicators having facility to display information from TCAS, GPS/GLONASS system and EGPWS.

(h) HF Communication Set.

(i) Fire Warning System is installed to improve reliability of performance and reduce spurious warnings.

(j) Modification of aircrew (Pilot, Co-Pilot, Navigator) seats and installation of folding Flight Engineer's seat. The seats are equipped with harnesses with inertial mechanisms.

(k) Oxygen masks/oxygen system. Oxygen system will be modified by installation of Qty-05 BKO-5M units with Qty-05 KM-114K oxygen masks with in-built microphones. Qty-04 BKO-5M units will be installed into aircrew's working places and Qty-01 unit will be installed in cargo cabin on the fuselage left side between frames 9-11.

(l) Headsets with Mike (with noise-cancellation circuit).

(m) Emergency Locator Transmitters.

**Additionally, following modifications are accomplished:**

Fuselage modification for noise/vibrations decrease inside cockpit.

Hydraulic system modification including filter in hydraulic drainage line and replacement of hydraulic pumps.

Implementation of modification providing possibility for emergency MLG bay Door lock opening in event of breaking of cable (STA/32-01-4108-560-000 or STA/32-01-4108-565-000).





# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL AND MODERNISATION. AN FAMILIES' AIRCRAFTS

**Following works and services are provided in respect of all AN family aircraft.**

For An-24, An-26, An-30 and their modification An-32B aircrafts:

- overhaul;
- all kinds of maintenance with regard to maintenance schedule (including maintenance within production facilities of the Customer);
- works on enhancement of resources and operational endurance according to records, approved by State Aviation Administration of Ukraine for that specimen of aircraft, which undergoes the process;

For An-24, An-26, An-30, An-32 and their modifications, An-74, An-74T, An-74T-100, An-74TK-100, An-74-200, An-74TK-200:

- overhaul
- re-equipment, modification, improvement with regard to construction records, approved by State Aviation Administration of Ukraine according to Maintenance Guidelines;
- reconditioning according to the construction and engineering records (including those within production facilities of the Customer);

For An-74, An-74T, An-74T-100, An-74TK-100, An-74-200 and An-74TK-200 aircrafts:

- maintenance according to maintenance schedule, including diagnostic and reconditioning works on stages No1, No2, No3;
- An-75 aircraft conversion into An-74TK-100C modification for the transportation of passengers according to the records, approved by the Authorised body in the field of civil aviation of the Russian Federation;
- overhaul of aircraft engines D-36, range 1, 1A, 2A;
- light overhaul of aircraft engines D-36, range 1;

An-26 aircraft conversion into An-26-100 modification, An-26B aircraft conversion into An-26B-100 modification, An-30A aircraft conversion into An-30A-100 modification with the view of passengers transporting – according to the records of the Constructor, approved by the Authorised body in the field of civil aviation of the Russian Federation;

An-24B, An-24RB, An-26, An-26B, An-30A aircrafts conversion into modification «Salon» according to the records of the Constructor, approved by the Authorised body in the field of civil aviation of the Russian Federation;

Installation of additional equipment to An-24B, An-24T, An-24RT, An-24RB, An-26, An-26B, An-26-100, An-

26B-100, An-30, An-30A-100, An-32A, An-32B, An-74 aircrafts according to the records of the Constructor, approved by the Authorised body in the field of civil aviation of the Russian Federation:

- equipment КУРС-МП-2 (КУРС-МП-70), СД-67 (СД-75), ВЭМ-72ФГ, ВМФ-50;
- system of ground proximity notification with early warning function EGPWS;
- global positioning system (GPS) for performance of flights within European area navigation system (BRNAV);
- cabin smoke warning systems СПС-БГО;
- insecure altitude change warning systems;
- emergency location transmitters of ARM-406AS, ARM-406P type;
- traffic alert and collision systems (TCAS-II or TCAS-94, CAS-67, TCAS-2000, SPS-2000 type);
- additional soft fuel tanks to An-24B and An-24RB





# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL AND MODERNISATION. SU AND MIG FAMILIES' AIRCRAFTS

Mid-life repair and repair as per technical state of all modifications of MiG-21, MiG-23, MiG-25, MiG-29, Su-17, Su-22, Su-25, Su-27 aircrafts, their aggregates and systems.

Repair of airframe with replacement of the elements of power units, accessories of airframe, fuel, hydraulic systems, air-conditioning system, pneumatic system, fuel tanks, aircraft armament, radio-commu-

nication equipment, avionics, electronic automatic systems, performance control devices and systems.

Warranty and after-warranty maintenance of repaired aircraft equipment, technical help and support. Theoretical and practical training of specialists in the field of overhaul of aircraft engines and all component aggregates at Customer's site as well as on the basis of Ukrainian plants.



**Modernisation of aircrafts of Su-22M3, Su-22UMZ, Su-22M4, Su-25, Su-25UB range.**

Modernisation provides for:

- enhancement of precision of aircraft attack weapon employment;
- widening of the scope of aircraft fighting capabilities (exercise of navigated bombing mode);
- increasing of precision of navigation tasks accomplishments);
- area search and memorising of geographical position of operational targets;



- transmittance of guidance signal to autopilot system from CH-3307 system while performing the flight on rout and in "RETURN" mode;

- broadening of the list of registered performance features for the diagnostics of accuracy of its exploitation and efficiency;

- computerised flight data processing according to the records of "Tester" system;

- output of the information (of modernised systems) to the panels of attitude director indicator and horizontal situation indicator.





# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL AND MODERNISATION. SU AND MIG FAMILIES' AIRCRAFTS

### Modernisation of aircrafts of Su-27, Su-27UB range.

Modernisation provides for:

- increase of solved tasks volume and increase of reliability of aim and navigating complexes;
  - exact bombing on the ground purposes with beforehand known coordinates without visual contact to them (navigating bombing) in any meteorological conditions;
  - an exact approach on the purpose in necessary time in any meteorological conditions;
  - use of RETURN, LANDING and REPEATING SETTING modes without presence of ground means of landing
- List of equipment installed to Su-27 and Su-27UB:
- equipment kit for GLONASS and GPS (CH-3307 or GNS-500W) type systems users
  - improved system "EKRAN-02M-3" (ЭКРАН-02M-3) in replacement of "EKRAN-02M", and "EKRAN-UB-06M-3" in replacement of "EKRAN-UB-06M";
  - on-board emergency flight data recorder BUR-4-1-10-01 with solid-state protective concentrator with

the records of voice and video information, with the enhanced folding frequency (512 measurements per second instead of 256 measurements per second of parametric information, and 2048 measurements per second instead of 512 (in emergency) of digital information) in replacement of "TESTER-UZ" system;

- squawk A-511, designed to operate with national secondary radars (SR) of air traffic control (ATC) systems and to transmit automatically aircraft number, flight altitude, fuel load and flight-pass vector information to the ground SR at their request. It ensures additional work with secondary radar systems of ATC RBS with regard to ICAO requirements in modes "AC" and "A". Squawk A-511 has several modes of work: "ARS", "ATC", "P-35", "READY", "AC", "A".
- equipment kit of helmet-mounted target detection "SURA-K" in replacement of standard "ShZUM-1";
- audio and video check system AVCS-27U for the recording to digital videotape (DVT) of video information, shown on IGB-31 with outside space picture given by on-board video-camera as a background.



Modernization of optical electronic sighting complex of MiG-29 aircraft

**The following system of the optical electronic sighting navigation complex includes modernized:**

- weaponry control system;
- navigation system;
- indication system;
- optical electronic sighting system.

**The purpose of modernization is:**

- increasing of the combat capabilities of an aircraft under carrying out the mission of striking the ground

and above-water targets by equipping an aircraft with guided aviation means of destruction of "air-surface" type with TV heads of homing guidance (X-29T, KAB-500 KR);

- improvement of the complex performance characteristics by incorporating satellite navigation system and upgrading of optical-electronic system;
- increasing of efficiency of the pilots` actions by introduction the navigation mode with displaying terrain digital maps and sighting information on multi-functional indicator.



## OVERHAUL, MODERNIZATION, LIFE EXTENSION

### OVERHAUL AND MODERNISATION

#### Besides

Routing repair and scheduled maintenance of IL-76, IL-76TD, IL-76MD, IL-78 aircraft (complete repair / overhaul cycle of IL-76, IL-76TD, IL-76MD, IL-78 is under development).

Overhaul and routing repair of equipment and components of IL-76TD, IL-76MD, IL-78, Yak-40, Yak-42, IL-38, IL-62 aircraft;



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#### Overhaul of L-39 aircraft

Upgrading of aircraft L-39C up to the level of L-39M (simulator of the fourth generation aircraft)





## OVERHAUL, MODERNIZATION, LIFE EXTENSION

### ENGINES and AGGREGATES OVERHAUL and MAINTANANCE

Overhaul of AL-21F-3 aircraft engines and its aggregates. The main are: NR-53D, RSF-53B, NP-96M, DTsN-72, FN-53, PGL-30ML, SK-224-1, RT-12-3, TS-21B, 4700T, aggregate 924

Overhaul of AL-31F aircraft engines, remote aggregates boxes and all component parts. The main are: NR-31V, RSF-31V/B, RT-31V, RTF-31A, FN-31A, NP-96M, DTsN-82, KRD-99, SK-224-6 series 1, TDK, 6139T, aggregate 4030

Overhaul of RD-33 2S aircraft engines and its aggregates. The main are: NR-59A, RSF-59A, NP-96M, DTsN-78, FN-59A, KSO-59A, RT-59E, RTF-59B, TDK, 4700-T, 4033, FG-11SN-T, BPR-88, SK-224-6 series 2.

Overhaul of R-29-300 (R-29B-300) aircraft engines of series 1, 2, 3, 4, and R-35-300 (0A, 0A-2)

Overhaul of R11, R13, R25, R-95SH, AI-25TL, M-14, GTDE-117 aircraft engines, auxiliary power units «Saphir-5» and aircraft gear boxes KSA-2 (3).

Overhaul and routing repair of equipment and components of Su-24 (all modifications)

Overhaul of D-36 aircraft engines, (range 1, 1A, 2A);

Overhaul of propellers AB-72 range 02A, AB-72T range 02A, AB-68DM.





# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL, RE-EQUIPMENT AND MODERNIZATION of helicopters

- overhaul and refurbishment, re-equipment and upgrade of Mi-8/Mi-17, Mi-24, Mi-25/35, Mi-26, Mi-2 helicopters of all series and modifications, their aggregates and systems;
- overhaul, re-equipment, maintenance of Ka-25, Ka-27, Ka-28, Ka-29, Ka-32 helicopters of all series and modifications, their aggregates and systems;
- investigation of helicopters' technical state at their operation sites;
- extension of TBO up to 200-500 flight hours and TBO lifetime up to 2-5 years;
- warranty and post-warranty servicing of helicopters at their operation sites;
- manufacturing of rubber items for overhaul of helicopter units;
- repair of HK-12CT gas-turbine engines for gas-pumping stations;
- repair of helicopter reducers;
- demilitarization and conversion of combat Mi-8 (Mi-9), Mi-8MT (MTV), Mi-17, Mi-14, Ka-27 (Ka-28) helicopters into civil modifications (cargo-passenger, passenger, VIP cabin, search and rescue, ambulance, fire-fighting);
- Mi-8 helicopters re-equipment by replacing TV2-117 A(G) engines by TV3-117 (VM, VMA, VMS) with upgrade of airframe construction elements and systems;
- Mi-8MT (Mi-17) helicopter re-equipment into Mi-8 MTV1 (Mi-171V) modification;
- modernization of helicopters and installation of additional equipment (with technical support of OJSC «Mil Moscow Helicopter Plant» and OJSC «Kamov»);
- helicopter repair at Customer's site as per documentation approved by OJSC «Mil Moscow Helicopter Plant» and OJSC «Kamov»;
- technical support of helicopter operation; delivery of equipment, aggregates, spare parts and materials to Customer;
- establishing of service centers at Customer's site for technical maintenance and overhaul of helicopters;
- training and advanced training of the Customers' specialists on overhaul, technical maintenance and operation of helicopters at the enterprise facilities and





# OVERHAUL, MODERNIZATION, LIFE EXTENSION

## OVERHAUL, RE-EQUIPMENT AND MODERNIZATION of helicopters



### **Customer's site;**

– helicopter painting in accordance with special technologies fulfilled with means of polyurethane and polyacrylic enamels of «DuPont», «Color Luck» «Akzo Nobel» and other leading manufacturers

### **The three independent lines for overhaul of «Mi» - series helicopters:**

- Line 1 - overhaul of heavy helicopters Mi-6, Mi-26 and their modifications.
- Line 2 - overhaul of middle-weight helicopters Mi-

8, Mi-17, Mi-24, Mi-35 and their modifications.

- Line 3 - overhaul of light-weight helicopters Mi-2 and their modifications.

Each line is supplied with ground maintenance devices, testing and diagnostic facilities, test bench equipment, tools and devices specifically per each helicopter type. The separate lines for helicopter overhaul allow adjusting the production facilities within a short period of time, meeting the customer's requirements and reducing the overhaul time.



# NEW TIME TECHNOLOGY



# SPECIALISTS' TRAINING



## SPECIALISTS' TRAINING

### PILOTS' AND GROUND ENGINEERS' TRAINING

Company provides for complex training of foreign nationals for helicopter pilots and ground engineers.

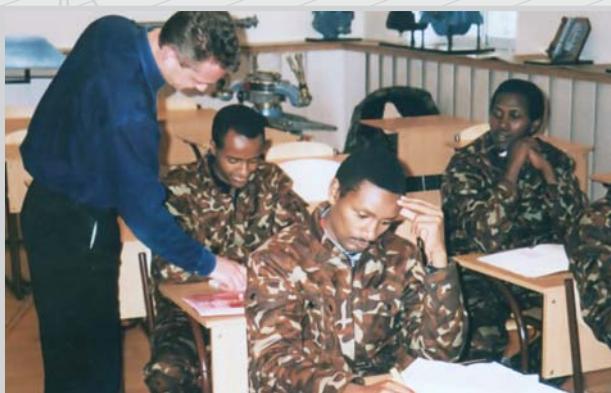
#### Theoretical training

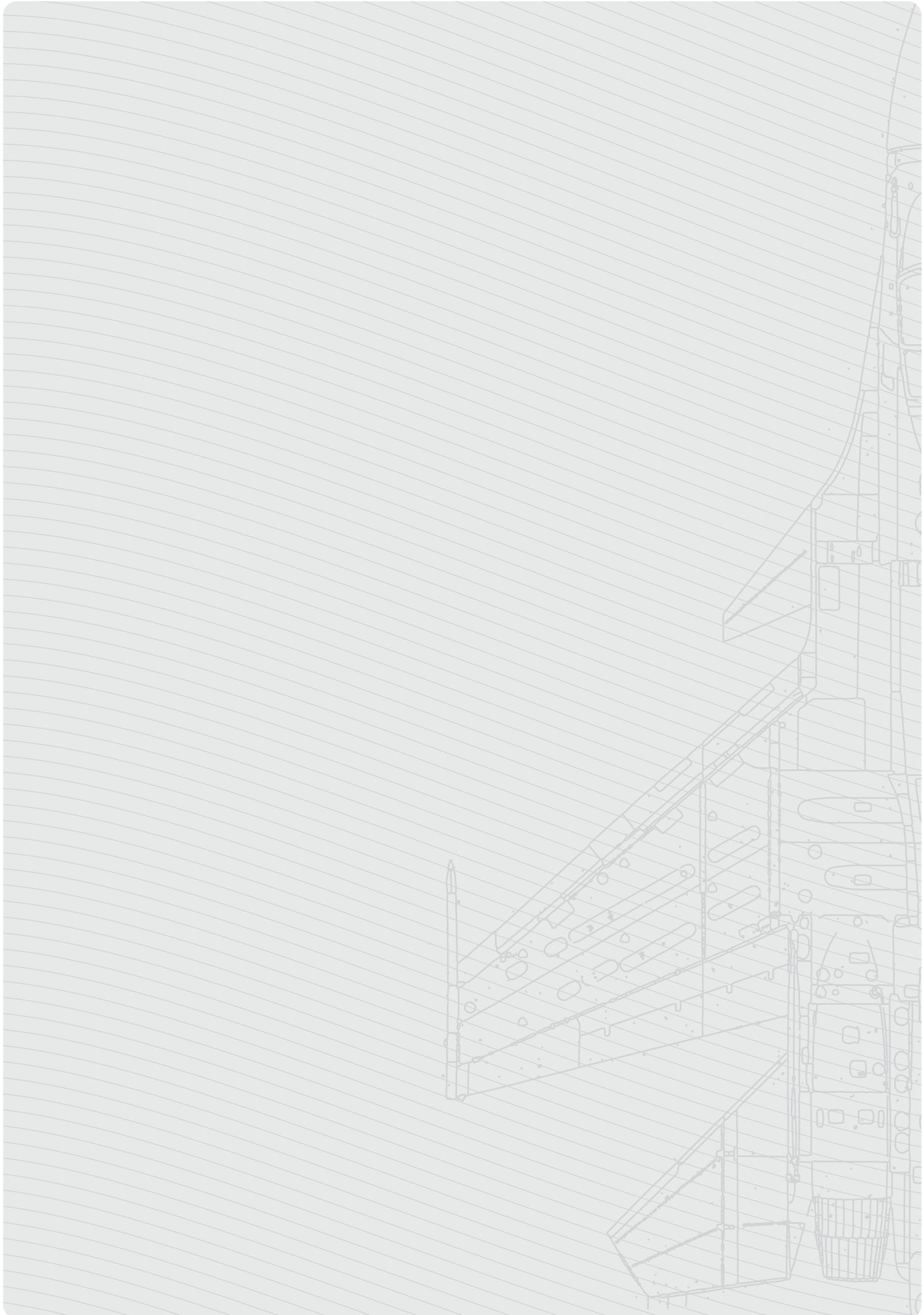
The programs correspond to the state standards of education and answer the conditions of multilevel training of the air specialists. It allows the graduates to continue training in other high schools. The programs of training can be transformed, taking into account the wish of the customer within the limits of the standard of education. All modern training facilities are available for educational process.

#### Flight training

The flight training of the cadets is carried out on Mi-2 and Mi-8 helicopters. In contrast to the old

standards, when practically all the program of the flight training was made in airfield conditions, now, the substantial part of educational flights is combined with industrial ones. On graduating cadets receive a certificate of the commercial pilot and diploma. The flight training of the domestic and foreign pilots on Mi-2, Mi-8, Mi-8MTB, Ka-32, Mi-26T helicopters is carried according to programs of international standards. Training is conducted by experienced and skilled pilots - instructors and commanders. Many of them have more than 20 years' experience. More than 25 percents of the flight staff of college have the admission to implement the international flights.







**NEW** TIME  
TECHNOLOGY



# SIMULATORS



## SIMULATORS

### SIMULATOR COMPLEX OF MI-24V HELICOPTER CREWTRAINING SYSTEM



#### INTENDED USAGE CHARACTERISTICS

The simulator allows to form, solidify and upgrade practical skills of a helicopter's crew in the course of accomplishment various flight tasks both by day and at night in any weather conditions and at any location.

The simulator offers manifold opportunities of creating various conditions of combat situation in the course of making air reconnaissance, air combat, attacks of both stationary and mobile ground objects under conditions of radio-electronic countermeasures and fighting against antiaircraft weapons of an enemy, fires and smoke screening at the battlefield. It also allows to simulate a wide range of emergency situations that may arise as a result of piloting errors, damages or technical failures of various joints and components of a helicopter.

#### TACTICAL CHARACTERISTICS

The opportunity of practical training a helicopter's crew for acquisition of skills in field use of various types of vehicle-born and outboard weapons (depending on the helicopter model starting from Mi-24V or Mi-35 and the chosen variant of a combat mount) with the use of various models of radar navigation aids.

#### Instructor's workplace provides for:

- assigning conditions for training;
- control of trainees' actions;
- simulation of failure of joints and components of a helicopter in the course of a training flight;
- control of position of control devices and trainees' actions in the course of training;
- management of the training (including its stopping and repeating situations);
- recording actions of trainees and a helicopter flight parameters;
- analysis and assessment of the quality of accomplishing exercises and flight tasks.



## SIMULATORS

### SIMULATOR COMPLEX OF MI-24V HELICOPTER CREW TRAINING SYSTEM

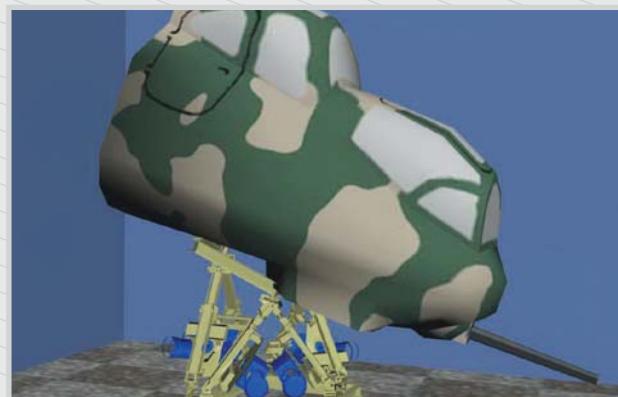
#### MI-24V HELICOPTER CREW TRAINING SYSTEM

##### Applicability:

- Individual training of pilots and flight operators;
- Operational coordination of pilots and flight operators as a part of a crew in the course of accomplishing piloting tasks, tasks of navigation and warfare stipulated in the Training programme.

##### The simulator consists of:

- Cabin for a pilot and flight operator equipped with display/control device simulators;
- 6-level freedom dynamic platform;
- Instructor's workplace.



#### EXAMPLES OF VISUALIZATION IN THE SIMULATOR



#### BASIC PERFORMANCE CHARACTERISTICS OF THE SIMULATOR

- Electrical power supply – 220 V, 50Hz;
- Consumable power – 18 kW;
- Running time - 12 hours per day;
- Guaranteed service period – 1 year;
- According to operating conditions, the simulator satisfies the following requirements:
  - Operation temperature - +5°C to +40°C;
  - Relative humidity up to 80% at the temperature of +25°C;
- Starting time – 5 min;
- Area of a room for the simulator – not more than 50 sq.m;

- Performance life of the simulator - 8 years at least on condition of adherence to service regulations and maintenance and repair carrying out according to operational documentation.

#### A set of technical documentation includes:

- Logbook;
- Operation manual;
- Manual for assembling and setting at the intended use point;
- List of spare parts.



## SIMULATORS

### MI-17 SIMULATOR COMPLEX



#### PURPOSE OF A SIMULATOR MI-17

Helicopter Mi-17 (Mi-171) Educational-Training Complex is intended for crew members training using the latest training methodologies:

LOFT (Line Oriented Flight Training) training in real conditions and in real time mode;

CRM (Crew Resource Management) crew members intercommunication and cooperation methods.

#### THE TRAINING COMPLEX COMPRISSES:

- helicopter flight simulator;
- flight and navigation procedures trainer;
- specialized simulators of functional systems;
- interactive computer program complex for training in Mi-17 and Mi-171 helicopter operating rules and testing the knowledge;
- mockups and profile forms of real units and assemblies;
- training stands of helicopter's structure;
- photo panels with helicopters images.

Computer-based interactive training modules provide excellent training on helicopter systems.



Computer training is backed up by fully functioning systems schematics, illustrated on full size moveable boards, that depict normal systems operation as well as all ground and in-flight failures.





## SIMULATORS

### MI-17 SIMULATOR COMPLEX

#### HELICOPTER FLIGHT SIMULATOR

The Flight Simulator is a complete replica of the Mi-17 / 171 helicopter cockpit, with all controls, switches and instrumentation reproduced.

The visual system can replicate all meteorological conditions, and the instructor's station monitors, inputs, and records all events.

#### SPHERICAL SCREEN

**The multi-channel visual system delivers a more detailed and life-like presentation than any other system on the market today:**

- 240° horizontal viewing angle;
- 70° vertical viewing angle.

The simulator is designed to train crews in proper flying, navigation, systems and equipment operation and emergency and abnormal operations, all in accordance with the Flight Manual.

The simulator is equipped with a full-motion system with six degrees of freedom, produced by MOOG company.

Motion is provided via an electro-mechanical system, eliminating the fire hazards associated with hydraulic motion systems.

#### INSTRUCTOR'S STATION

The seven-screen Instructor's Station makes it possible to monitor all crew members' actions during all phases of flight. Sortie creation, systems failure inputs, weather changes and training results and documentation are all possible here.





## SIMULATORS

### KTS-21M AND SOKIL-KTS FULL MISSION SIMULATOR FOR PILOT OF MIG-29



#### PURPOSE OF A SIMULATOR KTS-21M

The simulator is intended to provide flying - tactical preparation for flying staff of fighting divisions as well as for training of military educational institutions. The simulator provides significant reduction of financial expenses during training. The simulator is created with use the cockpit of simulator KTS-21.

#### The simulator provides an opportunity of working off the following simulation exercises:

- preparation for flight, start up of engines, movement on a runway, take off and climbing in a day and at night in any weather meteorological conditions, flight on a circle;
- performance of flight on a route, performance of aerobatics figures at small heights average, great and team flight in pair;
- flight in area of military operations, search, revealing and recognition of the ground, sea and air targets, aiming and defeat of the target;
- estimation of radio-electronic conditions by means of the special equipment;
- working off the actions of pilot in special cases of flight;
- conducting a radio communication of a plane with ground (instructor);
- landing approach on a programmed and non programmed air station.

#### STRUCTURE OF SIMULATOR:

- cockpit with simulators of the basic devices and systems of the plane;
- peripheral controllers with blocks of interface;
- three-channel of visualization system with look-up angle – 180 degrees on a horizontal and 45 degrees

on a vertical;

- information computer complex and a special software;
- instructor workplace;
- co-pilot workplace;
- set of the operational documentation;
- spares package;
- set of installation elements.

#### The simulator provides an opportunity for pilots to work out the following main tasks:

- Pre-flight check equipment procedures;
- Pre-flight check engines, start up engines on the ground, and in the air;
- Movement on a taxiway and runway in day, night and IMC (Instrumental Meteorological Conditions);
- Take-off and climb keeping visual contact to RW (Runway), locality, horizon line and take-off in night conditions;
- Instrumental flight and visual flight in full range of altitudes, speeds, pitch and roll angles, in manual and automatic controlling modes;
- Automatic and autonomous solving of the tasks of navigation programming the assign route, using all coordinates correction options, realized on a simulator;
- Performing the visual flight at low altitudes (tactical flight);
- Search, discover and recognition of the ground, marine and air targets. Aiming and using aviation weapon located at plane in all modes of operating, in day and night, VMC and IMC, under influence of radio-electronic hindrances;
- Recognition of the radio-emitting air defence facilities, evaluating the radio-electronic situation, using on-board means and training of pilots in actions, using plane defence complex;



## SIMULATORS

### KTS-21M AND SOKIL-KTS FULL MISSION SIMULATOR FOR PILOT OF MIG-29

- Flight in group;
- Aerobatic;
- Radio-communication;
- Approach and landing the airfield, landing with using the radiotechnical facilities and visually by day, night, VMC and IMC;
- Training the actions in emergency situations of flight, failure of equipment and systems, fire on board, other situations of Manual Instructions.

#### TECHNICAL CHARACTERISTICS OF SOKIL-KTS SIMULATOR

Min. space required for installing 102 sq metres.

Min. room height required 6 metres.

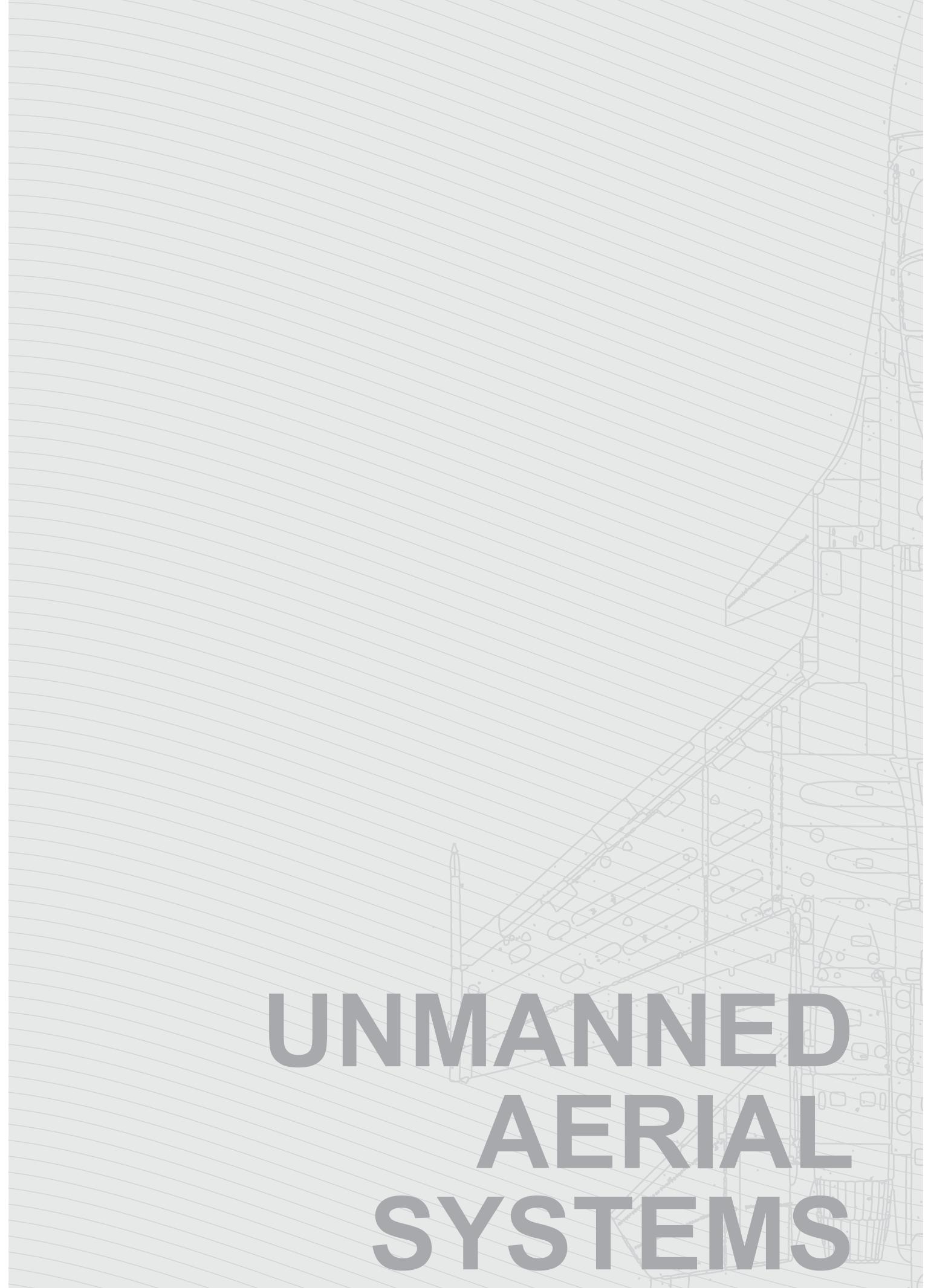
Max. electric power consumed 220/388 V 45 kW.

Temperatures range, not below +15 °C and not above +25 °C.

Continual operation time not less than 8 hours.  
 Assigned operation duration for period of 15 years using 16,000 hours.  
 Net weight of simulator 6,569 kg, Gross weight 9,160 kg.



# NEW TIME TECHNOLOGY



# UNMANNED AERIAL SYSTEMS



# UNMANNED AERIAL SYSTEMS

## «Chizh-L» Unmanned Aircraft Complex



Unmanned Aircraft Complex "Chizh-L" on the generally accepted classification of military Unmanned Aerial Vehicles (UAV) belongs to the class of tactical short-range systems to meet the requirements of aerial surveillance, reconnaissance and target designation. For the Military purposes can be used as part of the intelligence information systems the company, battalion and an artillery battery level.

When designing the complex originally envisaged the possibility of its limited use in the open air space for the action of special units to meet the challenges of aerial surveillance in emergency management, supporting counter-terrorist, security and search operations.

### Specification of the complex "Chizh-L":

- modularity of the aircraft and payload - 7 basic options of payload;
- simultaneous synchronous flight (formation) up to 4 UAVs;
- modularity and high mobility of complex;
- all-season, 24-hour, off-airfield;
- the possibility of flights to areas with difficult terrain (mountains) and over the sea (take-off and landing on a ship);
- high availability of complex systems;
- redundant radio channels to UAV (VHF range and satellite system «Iridium»);

The unmanned aerial vehicle has a modular design. It's made of composite materials to provide low visual, acoustic, thermal and radar visibility. The power plant is based on 2.5 hp two-stroke piston engine

UAV flight can be performed offline on the programmed route within a radius of 200 km from the ground control station or in real time within a radius of 50 km in the mode of remote management and control.

The entire complex, including ground support equipment are packed in compact containers for the transportation, which ensures a maximum mobility when using any type of transport.

The complex is easy to maintain, can be applied to unprepared terrain and does not require special infrastructure.

### Complex structure

- UAV (from one to five) in shipping containers;
- Ground control and surveillance station in a secure briefcase:
- Ground radio terminal;
- Ground power supply system;
- Catapult launcher;
- Set of spare parts and auxiliary equipment.

### Complex functioning

The operation of the complex is supported by (he team of four: a pilot-operator, a video surveillance operator, a mechanical engineer and an electronic equipment specialist. Deployment time of the complex for the start position does not exceed 30 minutes.

The aircraft takes off from a catapult launcher and performs the parachute landing completely automatically. The onboard computer manages the autonomous aircraft return in case of the command channel failure as well as the automatic emergency landing in case of a critical system fault, which assures the safe flight.

### UAVs payload

High-resolution color video camera, digital photo camera, infrared camera, video channel transmitter with antenna. The entire payload is placed in an easily replaceable nose module that provides different configuration options to broaden the scope of mission tasks.

### The on-board computer system

Provides an automated control, navigation, management and diagnostics. It is based on the inertial navigation system with a GPS correction. The UAV is either controlled by a pre-programmed set of three-dimensional waypoints, or switched into a semiautomatic mode to be controlled from the ground

### The ground Control Station

Provides mission planning, preflight on-board and ground systems diagnostics, aircraft equipment monitoring, (light and payload control, receiving and processing the surveillance video and photo data. Two operators manage up to four aircraft simultaneously.

### Main characteristics

Length – 1.67 m; wingspan – 2.0 m; take-off mass – 13 kg; payload mass 1.0 kg; endurance – 5 hours; range – Up to 200 km; cruise speed – 110 km/h; max speed – 180 km/h; ceiling – 6000 m.

# UNMANNED AERIAL SYSTEMS

## «Vorobey-M» Multi-purpose aircraft system

**Multi-purpose aircraft system for aerial surveillance, reconnaissance and monitoring based on miniature unmanned air vehicle.**

The portable unmanned aerial system based on a "Vorobey-M" ("Sparrow-M") mini-UAV performs a wide range of surveillance and reconnaissance missions, including the antiterrorist and emergency operations, as well as the Earth surface and atmosphere monitoring. The air vehicle can be equipped with photographic, television, infrared and acoustic equipment along with radiation, chemical and other special sensors of modular design.

### "Vorobey-M" mini-UAV characteristic features:

- Long flight endurance
- Up to 20 km mission range
- Permanent operation availability
- Complete autonomy and ease of operation
- Stealthy deployment

The air vehicle can take off and land at unprepared constricted areas and is able to cruise on the route and loiter over a designated area for a long time. The aircraft takes off using a bungee cord and then automatically lands into a special compact recovery device.

Equipped with an electric power plant, the "Vorobey - M" mini-UAV has integrated aerodynamic layout. Its airframe is made entirely of modern composite materials.

The small size of the air vehicle and low noise of its electric power plant provide stealthy deployment. Two aircraft together with the ground equipment get packed into a single small portable container.

The navigation, control and management systems provide the aircraft flight control and its onboard equipment operation, in either a pre-programmed autonomous or an automated remote mode. The mission plan can be reprogrammed during the flight. The command-telemetry and video channels provide two-way radio communication between the UAV and



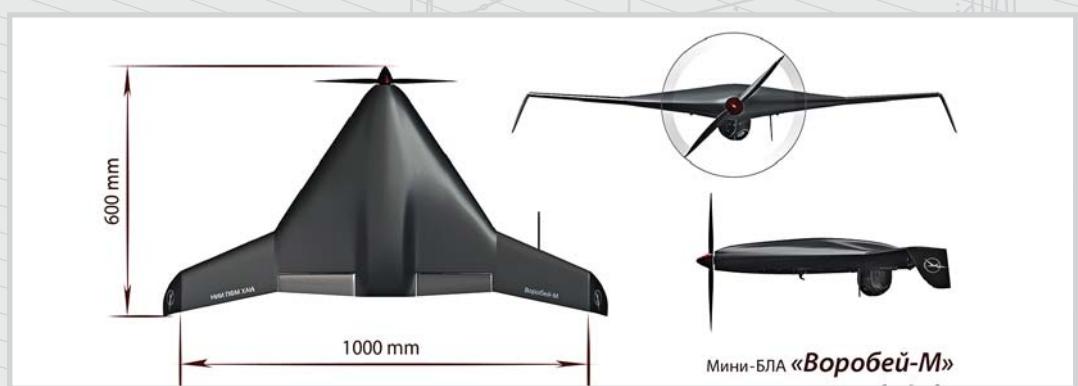
ground control station.

Due to the considerable automation, the UAV system is easy to operate and can perform complex surveillance and reconnaissance missions under day-time and night-time conditions without the operator having special flight skills.

### "Vorobey - M" mini-UAV prototype specifications

Length overall	600 mm
Height overall	150 mm
Wing span	1050 mm
Maximum take-off weight	2.5 kg
Maximum payload weight	0.3 kg
Engine type	electric
Engine power	350 W
Flight speeds:	
- max level	130 km/h
- cruising	90 km/h
- loitering	65 km/h
Maximum rate of climb	7 m/s
Service ceiling	3500 m
Maximum endurance:	
- in loitering mode	more than 1.5 h
- in cruising mode	1.0 h

### "Vorobey-M" UAV general arrangement





# UNMANNED AERIAL SYSTEMS

## «Vorobey-M VTOL» Vertical take-off and landing miniature unmanned air vehicle



The portable unmanned aerial system based on a "Vorobey-M VTOL" ("Sparrow-M VTOL") mini-UAV performs a wide range of surveillance and reconnaissance missions for support of antiterrorist and emergency operations within the industrial and urban environment. The air vehicle can be equipped with photographic, television, infrared and acoustic equipment along with radiation, chemical and other special sensors of modular design.

### "Vorobey – M VTOL" mini-UAV characteristic features:

- Vertical take-off and landing
- Ability of hovering over an observable object
- Permanent operation availability
- Full autonomy and simplicity of operation
- Stealthy deployment
- Up to 10 km mission range

The air vehicle can take off and land vertically at unprepared constricted areas and is able to cruise on the route, loiter over a designated area for a long time and hover in a defined airspace location. The capability of UAV hand launch and recovery is envisioned.

Equipped with lift-cruise electric power plant, the "Vorobey - M VTOL" mini-UAV has integrated aerodynamic layout. Its airframe is made entirely of modern composite materials.

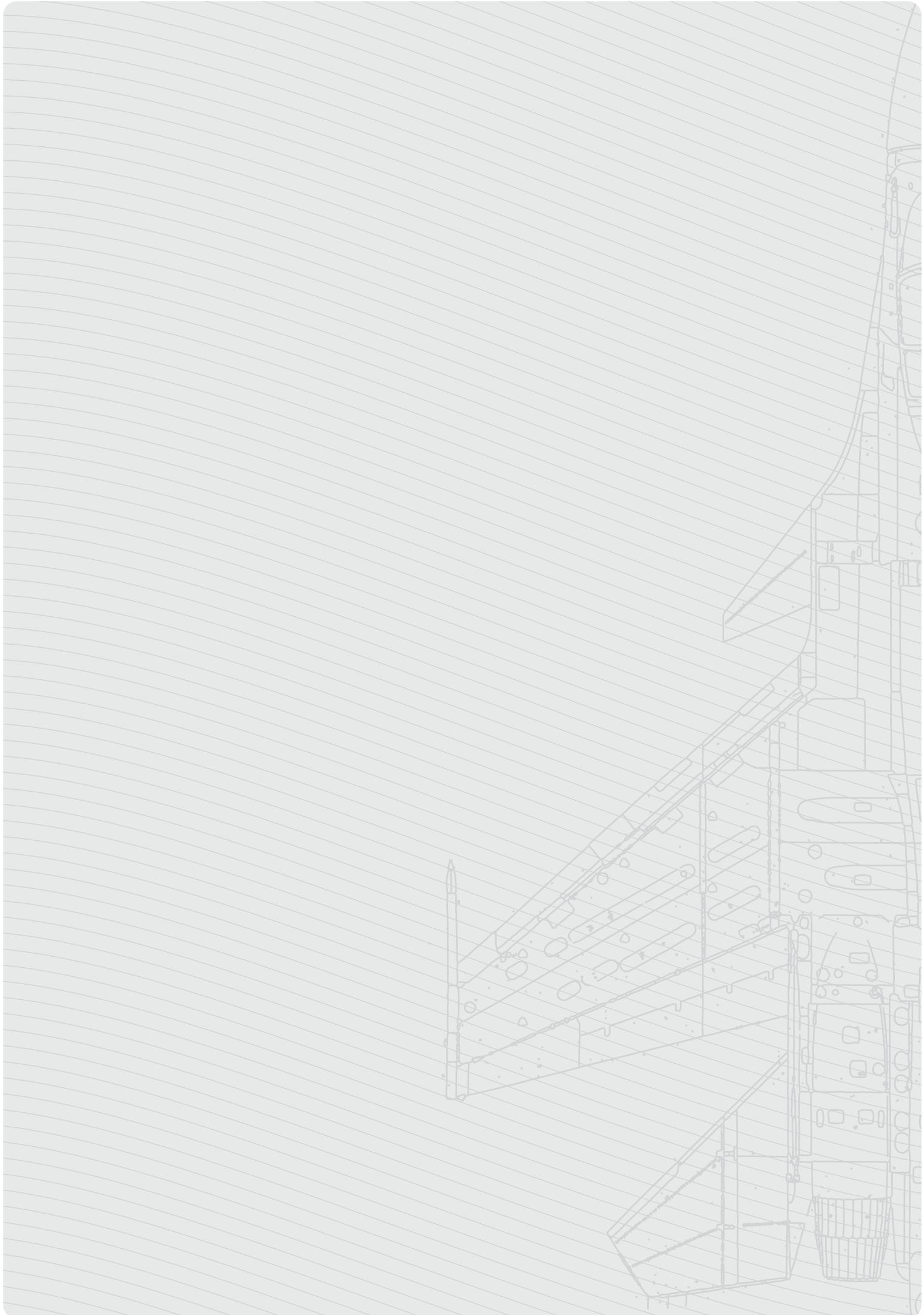
The small size of the air vehicle and low noise of its electric power plant provide stealthy deployment. Two aircraft together with the ground equipment get packed into a single small portable container.

The navigation, control and management systems provide the aircraft flight control and its onboard equipment operation, in either a pre-programmed autonomous or an automated remote mode. The mission plan can be reprogrammed during the flight. The command-telemetry and video channels provide two-way radio communication between the UAV and ground control station.

Due to the considerable automation, the UAV system is easy to operate and can perform complex surveillance and reconnaissance missions under day-time and night-time conditions without the operator having special flight skills.

### "Vorobey - M VTOL" mini-UAV prototype specifications

Length overall	600 mm
Height overall	200 mm
Wing span	1050 mm
Maximum take-off weight	3.0 kg
Maximum payload weight	0.3 kg
Engine type	electric
Engine power	600 W
Flight speeds:	
- max level	160 km/h
- cruising	90 km/h
- loitering	30÷65 km/h
Maximum rate of climb	12 m/s
Service ceiling	3000 m
Maximum endurance:	
- in loitering mode	45 min
- in cruising mode	30 min
- in hovering mode	15 min



# NEW TIME TECHNOLOGY



# PARACHUTE SYSTEMS



# PARACHUTE SYSTEMS

## ДПС-М The airborne parachute system



The airborne parachute system ДПС-М is intended for training and fulfilment of operational parachute jumps from troop-carriers aircraft An-12, An-22, An-26, An-32, An-72, Il-76, as well as from aircraft An-2 and from helicopters Mi 6, Mi-8, Mi-17 carried out by separate paratroopers or paratrooper groups with full standard arms and equipment or without it. This system is intended for paratroopers of all specialities at indicated airspeed of plane flight from 140 kph (38.9 mps) up to 400 kph (111.1 mps) from altitude from 200 m up to 8000 m with stabilization during 3 s and more. The total airborne weight of a paratrooper is 140 kg.

### DELIVERY SET:

Stabilization parachute	1 piece;
Parachute 83 m <sup>2</sup>	1 piece;
Harness	1 piece;
Container	1 piece;
Bag	2 pieces;
Semiautomatic unified combined safety device	1 set;
Operational documentation.	

### TECHNICAL SPECIFICATIONS:

Length, not more than, m	0.57;
Width, m	0.285;



Height, m	0.21 (packed);
Weight, not more than, kg	11.5;
Paratrooper weight, kg	up to 120;
Dropping out (aircraft) speed, km/h	140–400;
Dropping out altitude, m	200–8000;
Vertical speed, m/sec	5;
Average level speed, m/sec	2.



# PARACHUTE SYSTEMS

## ДПС-СН (ПССН) Aerial delivery parachute system of a special purpose (ADPS SP)

The Aerial delivery parachute system of a special purpose is intended for airlift delivery of parachutists-rescuers with the regular freight placed in the cargo container for fulfillment of search and rescue activities in difficult to access regions.

The Aerial delivery parachute system of a special purpose provides troop paratrooping from the aircraft equipped with a cable for compulsory enactment of parachute system.

The principal parachute of parachute system can be entered by means of a stabilizing parachute and by means of the exhaust link consolidated for a cable in aircraft cabin.

### Technical characteristics

1. Flight weight of the parachutist  
up to 180 kg
2. Indicated airspeed of an aircraft at dropping  
140-350 km/h
3. The maximum altitude at dropping  
4500 m
4. The minimum dropping altitude:
  - at immediate enactment of the principal parachute 250 m
  - with stabilization of decrease 400 m
5. Aerodynamic quality
  - principal parachute not less than 3,5
  - spare parachute not less than 2,4
6. Vertical velocity near the ground  
not more than 4 km/s

### General view of ДПС-СН (ПССН) parachute system with special freight container



7. Maximal overloads  
not more than 10 units
8. Turn on 360 degrees (time)  
not more than 6 seconds
9. Overall sizes of satchel with the packed parachute system, m, not more than:
 

Length	620 mm;
Width	470 mm;
Height	210 mm;
10. Parachute system weight, not more than  
21,1 kg
11. Services time, including shelf-life  
10 years
12. Resource of the parachute system  
200 applications



Principal Parachute Descending



Spare Parachute Descending





**«SpetsTechnoExport»  
Kyiv, Ukraine**

**Address in Ukraine:**  
7, Moskovsky prosp., Kyiv. 04073, Ukraine  
Ph. +380 44 568-50-72, Fax +380 44 568-50-62  
E-mail: dc1@ste.kiev.ua

**Permanent Representation in India:**  
F-911, Vasant Vihar, New Delhi – 110057  
Ph. +91 (11)26153792, Fax +91 (11)26153830  
E-mail: petr@ste.com.ua



«SpetsTechnoExport»  
Kyiv, Ukraine

**Address in Ukraine:**

7, Moskovsky prosp., Kyiv. 04073, Ukraine  
Ph. +380 44 568-50-72, Fax +380 44 568-50-62  
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