MOTOR SICH

HELICOPTERS PROGRAM
Motor Sich JSC whose headquarter plant was established in 1907 has occupied a distinguished place among the world’s leading aircraft engine manufacturers for a long time. A long way has been passed from developing and commercializing piston water-cooled aircraft engines to advanced competitive on the global market by-pass turbojet engines of up to 23.4 tf thrust, turboprop, turboshift, and turbopropfan engines of up to 14 000 shp for rotary- and fixed-wing aircraft, as well as for aeroderivative industrial gas turbine drives (GTDs).

Motor Sich JSC Quality System has been certified by Bureau Veritas Certification transnational agency for conformity to International Standard ISO-9001:2008 with reference to design, manufacture, overhaul and maintenance of aircraft engines.

Production and overhaul of aircraft engines have been certified by IAC Aviation Register and State Aviation Administration of Ukraine.

Motor Sich JSC has been recognized by IAC Aviation Register as a Designer of aircraft engines for civil aircraft (Certificate No. P-56).

The company obtained certificate CP No. 0009 of designer of the aviation equipment issued by the State Aviation Administration of Ukraine.

Motor Sich JSC is a designer and manufacturer of the engines as follows:
- TV3-117VMA-SBM1V (Type Certificate No. CT267-АДМ, Type Certificate No. TD0035);
- AI-450-MS (Type Certificate No. CT260-ВД, Type Certificate No. TDД 0009).

Motor Sich JSC has been granted:
- Additional type certificate No. ДТВ-0003 for the Mi-8MSB helicopter issued by the State Aviation Administration of Ukraine.
- Conformity Certificate issued by KACHESTVO Quality Centre for 4 types of 6.3 and 8 MW D-336 family gas-turbine drives (GTDs); as well as Conformity Certificate for Quality System of manufacturing the GTDs in question;
- Three Conformity Certificates issued by KACHESTVO Quality Centre for GTDs and power plants manufactured by Motor Sich JSC;
- Type Approval Certificate issued by SGS, Switzerland, for 10 types of GTDs.

High quality and reliability of products manufactured are ensured by advanced technologies, state-of-the-art equipment, high level of production standards, and highly qualified staff.

Services provided include: marketing, export/import operations, warranty and post-warranty support, overhaul and routine maintenance, operators’ personnel training, establishing overhaul facilities, selling licences, patents, and know-how.

Motor Sich JSC is not only an efficient company with a great potential but also a dependable and customer-oriented partner.
ENGINE THAT OPENS NEW HORIZONS FOR MI AND KA HELICOPTERS

To enhance helicopter operational performance, Motor Sich JSC has developed the TV3-117VMA-SBM1V engine. It has been designed in compliance with a requirements specification approved by Designers General of Mil MVZ JSC and Kamov JSC.

In 2007, Motor Sich JSC obtained Type Certificates CT No. 267-АМД granted by Aviation Register of Interstate Aviation Committee and No. ТД 0035 granted by State Aviation Administration of Ukraine for the TV3-117VMA-SBM1V propulsion engine. In 2009, the engine was introduced into service with the Ministry of Defence of Ukraine by GSI Act No. 02/08101-004.

In 2011 the TV3-117VMA-SBM1V engine passed State bench testing and confirmed its compliance with Requirement Specifications of the Ministry of Defence of the Russian Federation (SBT Report No. 14/711102-007ВП).

With TV3-117VMA-SBM1V engine being entirely interchangeable with previous versions of TV3-117V family engines, it ensures an increase in time limits and performance, and it does not require modification of airframe and aboard systems when re-motorizing helicopters previously manufactured.

Using design solutions matured previously on the TV3-117 family engines and on certified TV3-117VMA-SBM1 turboprop engine operated on An-140 passenger airplanes, as well as wide experience in manufacturing, operating, and overhauling helicopter engines produced by Motor Sich JSC, have allowed the company to develop a brand new engine.

Thus, changing compressor turbine design, i.e. discarding cover plates, and upgrading cooling system have allowed the company to achieve engine total life of 12,000 hours/12,000 cycles and time before the first overhaul of 5,000 hours/5,000 cycles.
The results of tests carried out in the thermal pressure chamber of FGUP CIAM research institute have validated the TV3-117VMA-SBM1V engine parameters set forth in specification requirements; and the results evidence high potential of the engine in question when operated under conditions of high temperatures and high altitudes.

The TV3-117VMA-SBM1V engine power ratings are adapted in the optimal way to operation at various helicopter types. Thus, the automatic control system makes it possible to adjust take-off engine power to 2,500, 2,400, 2,200 and 2,000 hp when testing it at the company premises; the automatic control system ensures flat rated power up to higher environment temperatures and flight altitudes when compared with other engine versions available to power Mi and Ka helicopters.

To boost safety of OEI flight, 2.5-minute power rating of 2,800 hp. The engine capability has been also proved with regard to using two versions of continuous power setting with one engine inoperative: with engine power being equal to 2800 h.p. for 60 min and engine power being equal to power of takeoff power setting.

To reduce helicopter climbing time, continuous take-off power rating has been introduced, which provides continuous operation of both engines at take-off power rating for more than 5 minutes, i.e. up to 30 minutes.

Installing the TV3-117VMA-SBM1V engines into the helicopter makes it possible to increase its rate of climb, altitude of helicopter service ceiling, and to preserve helicopter performance when installing the anti-sand device and the exhaust infra-red suppression system.

The requirements for the TV3-117VMA-SBM1V engine maintenance in operation comply with the current world wide system of the TV3-117 family engine maintenance.
In 2007, Aviation Register of Interstate Aviation Committee granted Type Certificates No.СТ267-АМД and No.ТД 0035 to Motor Sich JSC for TV3-117VMA-SBM1V propulsion engine.
In 2009 the TV3-117VMA-SBM1V engine passed State bench testing and put into service of the Ministry of Defence of Ukraine (Report No. 02/08101-004) and in 2011 the engine passed State bench testing in Russia and confirmed its compliance with Requirement Specifications of the Ministry of Defence of the Russian Federation (SBT Report No. 14/711102-007ВП).
OBJECTIVES OF DEVELOPING TV3-117VMA-SBM1V ENGINE

- Enhancing performances of Mi and Ka type helicopters:
  - Flat rated power maintenance up to high environment temperatures;
  - Increasing altitude of helicopter service ceiling;
  - Increasing helicopter rate of climb;
  - Reducing time of helicopter emergency climbing; both engines can operate at take-off power rating continuously up to 30 minutes in case of need;
  - High helicopter performance is preserved when installing the anti-sand device and the exhaust infra-red suppression system.

- Increasing engine time limits, reliability and durability:
  - Time before the first overhaul and TBO: .......................... 5,000 hours, 5,000 cycles
  - Total life: ................................................................. 12,000 hours, 12,000 cycles
  - Service life: ......................................................... 10 years

- Increasing OEI flight safety:
  - Introducing 2.5-minute power rating of 2,800 hp;
  - Introducing continuous power settings with one engine inoperative, with engine power being equal to 2800 h.p. for 60 min and engine power being equal to that of takeoff power setting.

- Enhancing economic performances:
  - Reducing operational at costs due to an increase in time before the first overhaul and time TBO;
  - Restoring engine airworthiness in operation by replacing the main assembly units and modules;
  - Implementing measures to increase engine operability;
  - Increasing the range of admissible turbine input gas temperature increment in the course of TBO enhancement.

In order to improve performance of the engine and helicopter, nowadays our work is aimed at development of the following versions:
- TV3-117VMA-SBM1V, series 1, with new ACS of the FADEC type
- TV3-117VMA-SBM1V, series 2, with modernized ACS (new engine electronic control ER 2500 instead of ERD-3VM, series 04 and RT-12-6, series 2).
LIST OF TV3-117VMA-SBM1V ENGINE DESIGN ENHANCEMENTS IN COMPARISON WITH PREVIOUS ENGINES OF TV3-117V FAMILY

1. Compressor
To reduce stresses and engine weight, the compressor stage 12 labyrinth disc design has been changed as well as its attachment to the rotor. To increase resistance of blade aerofoil surfaces and nozzle guide vane surfaces to erosion, they are plated with a protection coating.

2. Combustion chamber
A package of design and engineering measures have been taken to improve combustor output temperature field; to increase flame tube heat resistance; to prevent formation of carbon deposit and fuel coking; to reduce stress in the flame tube elements; to reduce fuel temperature; and to remove carbon deposit in the manifold.

3. Compressor turbine
To increase compressor turbine impeller life and reliability, the covering disks have been discarded. The system of cooling the disks, bearing supports, and nozzle guide vanes of compressor turbine has been upgraded, which made it possible to reduce air bleed for cooling and increase operation cycle efficiency. Material to manufacture the blades and nozzle guide vanes of stage 1 of compressor turbine has been substituted for one more heat resistant. Design changes have been introduced into blade roots of stages 1 and 2 of compressor turbine.
To boost engine operation reliability, the thermocouple wiring harness has been moved from the casing of stage 1 NGVs to the stage 3 NGVs zone, i.e. to the lower temperature zone.

4. Free turbine
To increase free turbine rotor wheel life and reliability, design and material of free turbine blades and disks have been changed. The disks are thicker and free from end face splines; and the blade shank is wider. To improve blade roots cooling, the axial clearances between the blade root platforms and the stator have been reduced.

5. Automatic control system
To ensure the optimal gas-generator rotor rpm and gas temperature in front of the compressor turbine, the 1-4 NGVs and IGVs apertures have been widened to increase the airflow rate. To ensure change of the maximum gas-generator rotor rpm and NGVs and IGVs control, the fuel control unit, EEG, as well as the NGVs and IGVs control hydraulic power cylinder have been modified slightly.
TV3-117VMA-SBM1V TURBOSHAFT ENGINE

- New technical solutions incorporated into engine design
# Main Data of TV3-117VMA-SBM1V Engine

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameters</th>
<th>TV3-117VMA-SBM1V (basic version)</th>
<th>TV3-117VMA-SBM1V-01</th>
<th>TV3-117VMA-SBM1V-02</th>
<th>TV3-117VMA-SBM1V-03</th>
<th>TV3-117VMA-SBM1V 4E series</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Engine power under power rating (SLS, ISA), shp</td>
<td>2,800</td>
<td>2,800</td>
<td>2,800</td>
<td>2,800</td>
<td>1,700</td>
</tr>
<tr>
<td>1.1</td>
<td>2.5-minute power setting and continuous power rating – 60 min (Cont 1) with OEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Continuous power rating – 60 min (Cont 2) with OEL</td>
<td>2,500</td>
<td>2,400</td>
<td>2,200</td>
<td>2,000</td>
<td>1,500</td>
</tr>
<tr>
<td>1.3</td>
<td>Continuous take-off power rating for 30 minutes</td>
<td>2,500</td>
<td>2,400</td>
<td>2,200</td>
<td>2,000</td>
<td>1,500</td>
</tr>
<tr>
<td>1.4</td>
<td>Take-off power rating</td>
<td>2,500</td>
<td>2,400</td>
<td>2,200</td>
<td>2,000</td>
<td>1,500</td>
</tr>
<tr>
<td>1.5</td>
<td>Maximum continuous power rating</td>
<td>1,900</td>
<td>1,900</td>
<td>1,700</td>
<td>1,700</td>
<td>1,200</td>
</tr>
<tr>
<td>1.6</td>
<td>Cruise I power rating</td>
<td>1,750</td>
<td>1,750</td>
<td>1,500</td>
<td>1,500</td>
<td>1,000</td>
</tr>
<tr>
<td>1.7</td>
<td>Cruise II power rating</td>
<td>1,200</td>
<td>1,200</td>
<td>1,200</td>
<td>1200</td>
<td>–</td>
</tr>
<tr>
<td>1.8</td>
<td>Idle power rating, max.</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>2.1</td>
<td>Having its 2.5-minute power and continuous power – 60 min (Cont 1) flat with one engine inoperative $t_{\text{min}}$, $C^*$</td>
<td>+25</td>
<td>+25</td>
<td>+25</td>
<td>+25</td>
<td>+41</td>
</tr>
<tr>
<td>2.2</td>
<td>Takeoff power and continuous power 60 minutes (Cont 2) with one engine inoperative are flat rated up to, $C^*$</td>
<td>+37</td>
<td>+41</td>
<td>+50</td>
<td>+58</td>
<td>+55</td>
</tr>
<tr>
<td>3.</td>
<td>Specific fuel consumption at take-off power rating, max., kg/(shp-h)</td>
<td>0.209</td>
<td>0.210</td>
<td>0.214</td>
<td>0.220</td>
<td>0.265</td>
</tr>
</tbody>
</table>
Established at Motor Sich JSC and successfully functioning is experimental design bureau oriented on designing of new helicopters having takeoff weight of 4 to 7 tons and on upgrading of the fleet of helicopters such as Mi-2, Mi-8, and Mi-24.

The experimental design bureau consisting of more than 250 persons is certified by the authorities of Ukraine and possesses Designer Certificate No. CP-0009 dated 17.11.2011.

Having company owned experimental design bureau, Motor Sich JSC is absolutely responsible for the following:
- designing of versions of the Mi-8MSB and Mi-24MSB helicopters;
- performing work aimed at upgrading;
- estimation, establishment and extension of service life for the helicopters;
- after-sale service of the helicopters.
MI-8MSB
MEDIUM CLASS TRANSPORT HELICOPTER
In 2011, the State Aviation Administration of Ukraine issued to Motor Sich JSC Certificate CP No. 0009 for designer of aviation equipment and Additional type certificate No. ДТВ-0003 for the Mi-8MSB helicopter.

Founded for promotion of own aviation products and mastering of new business lines was the Helicopters Motor Sich Ltd.. The main function of this specialized subdivision consists in organization of production of own high-performance helicopter. In 2012 the helicopters production was certified by the State Aviation Authorities of Ukraine.
### COMPARATIVE CHARACTERISTICS OF MI-8T, MI-8MTV AND MI-8MSB

<table>
<thead>
<tr>
<th>Operational parameters</th>
<th>MI-8T</th>
<th>MI-8MTV</th>
<th>MI-8MSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Engine type</td>
<td>TV2-117A</td>
<td>TV3-117VM</td>
<td>TV3-117VMA-SBM1V series 4E</td>
</tr>
<tr>
<td>2 Engine power, hp</td>
<td>2 x 1,500</td>
<td>2 x 2,200</td>
<td>2 x 1,500</td>
</tr>
<tr>
<td>3 Engine starting system</td>
<td>electrical</td>
<td>air</td>
<td>electrical</td>
</tr>
<tr>
<td>4 Dynamic ceiling, m</td>
<td>4,500</td>
<td>6,000</td>
<td>8,240</td>
</tr>
<tr>
<td>5 Flying range without ferry tanks, km</td>
<td>480</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>6 Fuel consumption per hour</td>
<td>620</td>
<td>610</td>
<td>500</td>
</tr>
<tr>
<td>7 Maximum take-off mass, kg</td>
<td>12,000</td>
<td>13,000</td>
<td>12,000</td>
</tr>
<tr>
<td>8 Standard take-off mass, kg</td>
<td>11,100</td>
<td>11,100</td>
<td>11,100</td>
</tr>
<tr>
<td>9 Maximum mass of cargo transported inside cargo compartment (due to decrease of fuel reserve), kg</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>10 Maximum mass of cargo transported on external mount, kg</td>
<td>2,500</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>– of hinged pendulum type</td>
<td>3,000</td>
<td>4,000</td>
<td>3,000</td>
</tr>
<tr>
<td>– of rope type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Cruise speed at altitude up to 1000m, km/h:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– with standard take-off mass</td>
<td>220-230</td>
<td>250</td>
<td>220-230</td>
</tr>
<tr>
<td>– with maximum take-off mass</td>
<td>205-215</td>
<td>230</td>
<td>205-215</td>
</tr>
<tr>
<td>12 Range of ambient air operational temperatures, °C</td>
<td>+35</td>
<td>+55</td>
<td>+60</td>
</tr>
</tbody>
</table>
COMPARISON OF TV2-117 AND TV3-117VMA-SBM1V SERIES 4E ENGINES PERFORMANCE

Environmental conditions at which engine takeoff power is flat-rated

- TV2-117
- TV3-117VM
- TV3-117VMA-SBM1V Series 4E
COMPARISON OF TV2-117 AND TV3-117VMA-SBM1V SERIES 4E ENGINES PERFORMANCE

- Acceleration time, s
  - TV2-117: 16
  - TV3-117VM: 8
  - TV3-117VMA-SBM1V Series 4E: 14

- First overhaul period and TBO, hrs
  - TV2-117: 5000
  - TV3-117VM: 1500
  - TV3-117VMA-SBM1V Series 4E: 2000
ADVANTAGES OF THE MI-8MSB HELICOPTERS OVER THE MI-8 AND MI-17 HELICOPTERS

1. Operation of the helicopter at altitudes up to 7300 m and provision of basing at altitudes up to 5000 m with a possibility of shutdown of the engines.

2. Fuel consumption improvement by 20% in comparison to the Mi-8 and Mi-17 helicopters, which make it possible to increase flying range or payload.

3. Flight safety improving, provision of possibility to continue the flight without altitude loss for one hour in case of failure of one of the engines.

4. Stable operation of the helicopter in regions with marine climate, under tropical conditions and in the regions with hot climate and in zones with high content of dust and smoke.

5. Reduction in operation and maintenance expenditure.
Following the stage of special high-temperature and high-level tests in Tadzhikistan, the Mi-8MSB helicopter equipped with TV3-117VMA-SBM1V Series 4E engines reached 8,200 m altitude on September 27, 2012, at the 8th International air show ‘AVIASVIT-XXI’, thus breaking an absolute world record for helicopters with takeoff weight from 6,000 to 10,000 kg (E-1g in accordance with FAI classification).
MSB-2
LIGHT MULTIPURPOSE HELICOPTER
Created in 1961 in MVZ (Mil plant), Mi-2 helicopter was the first national helicopter with gas turbine power plant.

1961 – Mi-2 helicopter was created.
1963 – design documents and license for production were transferred to PZL Swidnik plant in Poland.
1965 – Batch production of Mi-2 helicopter was started in Poland.
1992 – Production of Mi-2 helicopter was discontinued.
Approximately 5.5 thousand Mi-2 helicopters were produced during the total period of batch production.
Purpose of program is a creation of MSB-2 light helicopter (weight 4.2 ton) with enhanced performance characteristics instead of obsolete Mi-2 helicopter (weight 3.5 ton) due to:

- use of up-to-date efficient higher-power AI-450 M engines;
- new fuel tanks installation on external suspension, which will make it possible to increase a payload volume of cargo compartment, enhance human factor characteristics of passenger compartment, and increase a flying range;
- installation of new up-to-date aircraft instrumentation that comes up to ICAO standards, which will make it possible to solve wider range of problems.
COMPARISON OF OBSOLETE GTD-350 AND AI-450M ENGINE

<table>
<thead>
<tr>
<th></th>
<th>Mi-2</th>
<th>MSB-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specs</strong></td>
<td>GTD-350</td>
<td>AI-450M</td>
</tr>
<tr>
<td><strong>Take-off power, hp</strong></td>
<td>400</td>
<td>465</td>
</tr>
<tr>
<td><strong>Specific fuel consumption, kg/eshp·h</strong></td>
<td>0.37</td>
<td>0.26</td>
</tr>
<tr>
<td><strong>Weight, kg</strong></td>
<td>130</td>
<td>105</td>
</tr>
</tbody>
</table>

GTD-350

AI-450M
## DISTINCTIVE FEATURES OF MSB-2 HELICOPTER

### PERFORMANCE CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>MI-2</th>
<th>MSB-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine (qty, type, version)</td>
<td>2 x GTD-350</td>
<td>2 x AI-450M</td>
</tr>
<tr>
<td>Take-off power, hp</td>
<td>2 x 400</td>
<td>2 x 465</td>
</tr>
<tr>
<td>Crew, persons</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Passengers, persons</td>
<td>8</td>
<td>7-9</td>
</tr>
<tr>
<td>Max. take-off mass, kg</td>
<td>3,550</td>
<td>4,000</td>
</tr>
<tr>
<td>Cargo inside aircraft compartment, kg</td>
<td>800</td>
<td>1,000</td>
</tr>
<tr>
<td>Cargo on the external suspension, kg</td>
<td>700</td>
<td>900</td>
</tr>
<tr>
<td>Max. speed, km/h</td>
<td>210</td>
<td>235</td>
</tr>
<tr>
<td>Cruise speed, km/h</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>Static ceiling, m</td>
<td>640</td>
<td>1,500</td>
</tr>
<tr>
<td>Practical ceiling, m</td>
<td>4,000</td>
<td>4,500</td>
</tr>
<tr>
<td>Flying range without ferry tanks, km</td>
<td>300</td>
<td>550</td>
</tr>
</tbody>
</table>
STAGES OF MSB-2 HELICOPTER CREATION

First stage of creation covers:
- New aircraft compartment design.
- Installation of up-to-date AI-450M engines with improved fuel efficiency, which will make it possible to increase a flying range.
- Removal of fuel tank out of aircraft compartment and its mounting on an external suspension.
- Modification of fuselage to increase payload volume of passenger compartment.
- Installation of upgraded aircraft instrumentation of various versions.

Second stage of creation covers:
- Improvement of design of blades, bushings, transmission and reduction gear, which will make it possible to install still more powerful engines and increase helicopter thrust.
- Creation of light helicopter possessing enhanced performance capability, such as: transport, trainer, ambulance, surveillance, VIP, agriculture application, military, etc.

- units and accessories to be upgraded
MSB-2 TRANSPORT-PASSENGER HELICOPTER

Transport-passerger version is intended for:
- Transportation of cargo and passengers to remote and hardly accessible settlements.
- Utilization as air taxi inside the city and between settlements.
- Delivery of workers to hardly accessible working sites (derricks, personnel performing servicing works on oil and gas trunk pipelines).
- Utilization for corporate transportation and in general purpose aviation.
MSB-2 SEARCH-AND-REScue HELICOPTER

Search-and-rescue helicopter version provides:
- Delivery of crisis team experts and equipment in due time to crisis and emergency spots for rendering urgent aid.
- Evacuation of injured persons and victims of emergency situations.
- Urgent delivery of medicines.
- Transportation of special divisions of Ministry of Emergency Situations.

120 kg capacity cable hoist is installed at the left side to carry out lifting of cargo and people.
Searchlight is mounted under the fuselage.
The version of helicopter may be adapted for flights in night conditions.
It is possible to install additional equipment: for search-and-detection equipment and fire-extinguishing means.
Helicopter is able to carry out rescue operations during 2 hours without refueling.
MSB-2MD AMBULANCE HELICOPTER

Upgraded Mi-2 helicopter for urgent medical aid delivery is intended for:
- Delivery of medical team in emergency situations to the place where accident happened.
- Delivery of prompt aid.
- Transportation of sick and injured persons.

This version of helicopter has complete set of required equipment which, as to its functionality, is similar to equipment of ground ambulance vehicles.
Basic version provides disposition of two stretchers with severely ill patients, one injured person in sitting position and two medical attendants.
MSB-2P FIRE FIGHTING HELICOPTER

Fire fighting version of upgraded Mi-2 helicopter is intended for:

Fire fighting in hardly accessible regions, including forests and mountains.

Helicopter flight performance characteristics ensure high precision of water ejection when performing fire extinguishing.

It is supposed to equip fire fighting version with Simplex fire extinguishing system (mass 170 kg, capacity 900 litres) to be installed under the fuselage or inside cargo compartment. The fire extinguishing system allows to perform water intake at 3 m altitude using submersible pump. Water ejection is performed in the shortest time: 3 to 4 seconds. Control of water intake and ejection is performed by the pilot. It is possible to perform partial water intake (1/4, 1/2, 3/4 of capacity) and partial ejection (1/2 of capacity).
MSB-2SKH AGRICULTURAL HELICOPTER

Agricultural version helicopter is intended for treatment of agricultural plants by means of aerial spraying or dusting with various types of chemicals.

Helicopter is able to carry out agricultural work during 2 hours without refueling.

The helicopters are equipped with:
- tanks for liquid or powder chemicals and fertilizers;
- fittings for atomization of powder mixtures or rods with nozzles for sprinkling liquid mixtures.

Installation of feed tanks is possible either inside the fuselage or outside – at both boards of the fuselage.

The systems utilized are easily demountable, their mounting and demounting may be performed in field conditions.
MSB-2MO MILITARY HELICOPTER

Helicopter mission is the accomplishment of tactical tasks of Ministry of Defence units. Military version is intended for installation of two armament trusses for disposition of Б8В20A units of unguided missiles or УПК23-250 multipurpose gun containers.

This helicopter may be equipped with night-vision devices.
RANGE OF SERVICES OFFERED TO OPERATOR
WITHIN WARRANTY AND POST-WARRANTY PERIODS

OPERATOR

Regional representatives at sites
(at Operator’s)

- Delivery of spares
- Delivery of tooling
- Factory overhaul of helicopter and its units

Operator support center

- Spares repair
- Light overhaul of helicopter and its units at Operator’s

- Engineering support
- Technical publications
- Training of Operator’s personnel
HELICOPTERS FLEET MANAGEMENT PROGRAM

Airline

Maintenance of engines removed from the wing

On-site assistance

Provision of spare parts and modules

Maintenance of engines on the wing
ASSISTANCE IN MAINTENANCE AND OPERATION

- Rendering assistance to Operators in case of problems beyond the scope of regular maintenance and troubleshooting
- Special checks
- Check of characteristics, adjustment and testing of engines
- Checking engines in shop
- Comparing engine parameters with bench test results
- Restoration of engines by replacing modules in Manufacturer’s technical center at TsIAM institute facilities (Moscow).
REPAIR OF HELICOPTER AND IT’S UNITS

- High technologies and modern production base afford to perform high-quality repair of helicopter and its units at short notice recovering the original time limits and service characteristics.

- Great possibilities for Operator in the field of helicopters stock management:
  - Program of exchanging component parts and individual spare parts in the course of routine maintenance
  - Operator takes independent decision regarding the scope of the following types of repair:
    - restoration
    - light overhaul
    - major overhaul
    - exchange
  - Concluding contracts for different types of maintenance in the course of helicopter and its units in-service supervision
  - Helicopter and its units upgrading can be performed simultaneously with its repair at Operator’s request

SUPPLY OF SPARE PARTS AND TOOLING

- Supplying Operator with spare parts and tooling throughout helicopter and its units life cycle is one of the priority trends of the Motor Sich JSC activity

- Giving recommendations regarding orders on spare parts and tooling for the initial operation period

- Rendering services to airlines on drawing orders for spare parts and tooling and delivery of the above

- Urgent shipment of spare parts in case of aircraft downtime

- Arrangement of regional stores for spares and tooling

- Shipment of tooling for replacement of helicopter modules by the trained Operator’s personnel

- Availability of stores of spares in Russian Federation

Any issue related to delivery of helicopter, modules and tooling can be quickly solved owing to Manufacturer’s airline through an agreement with Operators.
TRAINING OF OPERATOR’S PERSONNEL

- Training on all aspects of helicopter and it’s units maintenance:
  - Theoretical and practical training
  - Examination of characteristics, adjustment and testing helicopter and it’s units
  - Troubleshooting
  - Visual inspection and borescopic inspection of engine
  - Helicopter and it’s units serviceability trend monitoring
  - Application of non-destructive methods of inspection
  - Maintenance
  - Helicopter and it’s units fleet management

- Training programs specifically tailored at Operator’s request including training on replacement of modules crowned by granting Certificates

- Readiness to organize training at Operator’s
REPRESENTATION OFFICES OF MOTOR SICH JSC

◆ **Ukraine**
30, Shelkovichnaya St., Kiev, 01080, Ukraine
Tel.: +380 44 253 9105, 253 4083
Fax: +380 44 253 9034
E-mail: motorsich@voliacable.com

◆ **Russia**
14, Novopeschanaya St., Moscow, 125252, Russia
Tel/Fax: +7 495 4115155
E-mail: info@motorsich.ru
http://www.motorsich.ru

◆ **China**
Representative Office
Asia Hotel, Office No. 403, No.8 Gongti bei lu, Xinzhong xi jie
Dongcheng District, Beijing, China, 100027
Tel/Fax: +8610 65515762;
E-mail: motorsich_china@mail.ru

◆ **UAE**
Regional Office
Plot F4-02, SAIF Zone, Sharjah, U.A.E.
Tel.: +971 6 5578097
Fax: +971 6 5578098
E-mail: motorme@eim.ae

◆ **Algeria**
Regional Representation
81, Lotissement, El Feth, “Les Sables Rouges”, El Biar, Algiers, Algeria, 16030
Tel.: +213 21 923 720
Fax: +213 21 798 749
E-mail: suprun.ms@mail.ru

◆ **India**
India Liaison Office
24 Ferozeshah Rd., New Delhi, India, 110001
Tel.: +91 11 43504903
Fax: +91 11 43504902
E-mail: msindia@mail.ru

◆ **Bangladesh**
Representative Office Dakiv Corporation
House-95, Road-06, Block-C, Banani, Dhaka, Bangladesh
Tel.: +88 02 8834617
E-mail: bromotor@dhaka.net, bstech_ms@dhaka.net

◆ **Belarus**
131 Bogdanovicha Street, Minsk, 220123, Belarus

◆ **Brazil**
Brasil Representative Office
SQS, QD 403, BL R, apt 306, Asa Sul, Brasilia DF, Brasil
Tel.: +55 61 83280212
E-mail: brazil@motorsich.com
Motor Sich JSC
15, Motorostroiteley av., Zaporozhye,
69068, Ukraine
Phone: (+38061) 720-55-14
Fax: (+38061) 720-44-63
E-mail: helicopter@motorsich.com
http://www.motorsich.com