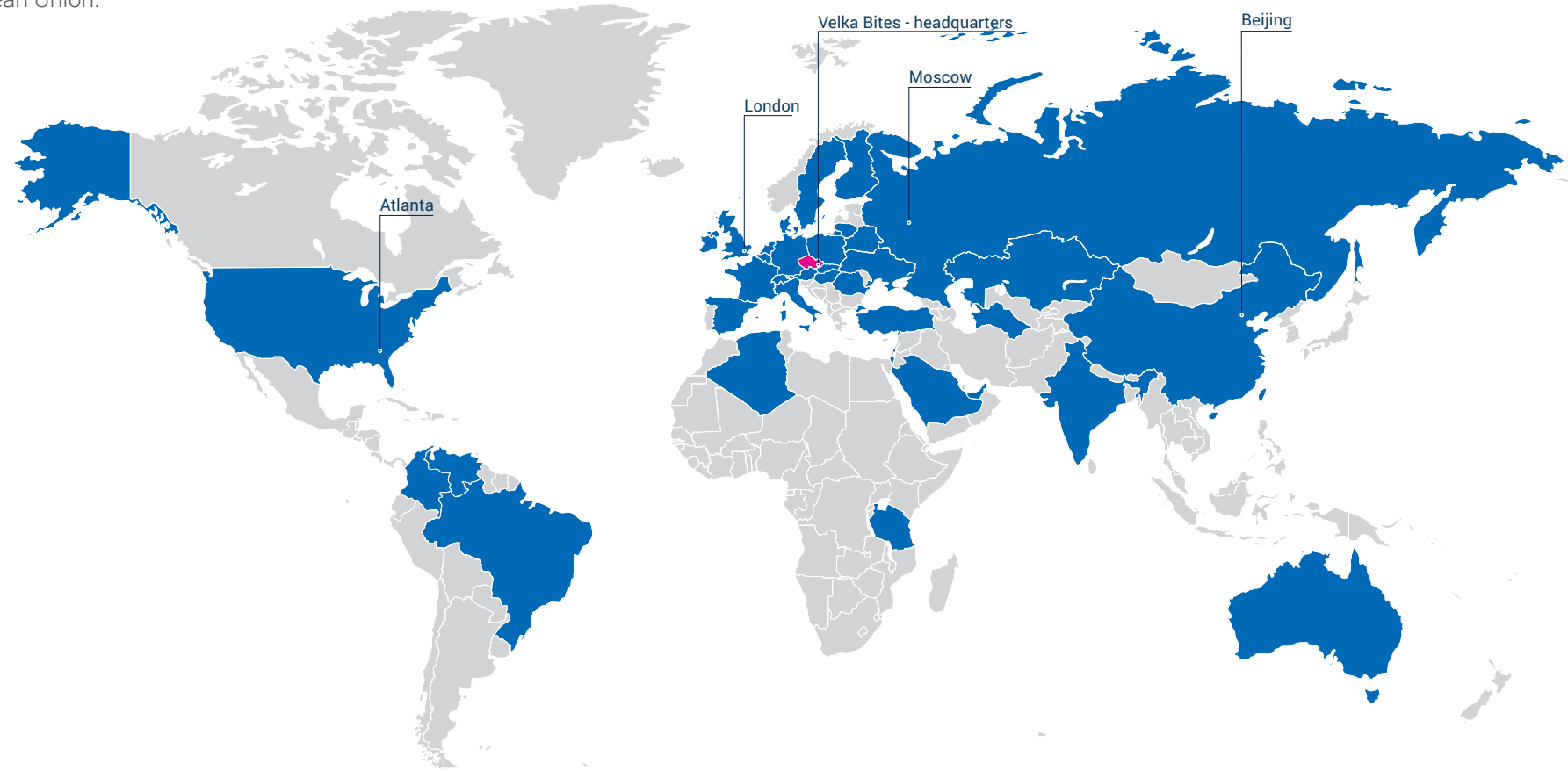

PBS Velka Bites
SINCE 1814
Aerospace technology

# About PBS Velka Bites

PBS Velka Bites (PBS) is a successful and reliable partner to many significant aviation manufacturers and final assemblers. PBS has been a leading manufacturer of products and equipment for the international aerospace industry for almost 50 years. The unique ability of PBS to carry out in-house development, manufacture and testing of aircraft products in accordance with global aerospace standards has greatly contributed to its enduring success on the global market.
A Quality and Environmental Management System that complies with ISO 9001, AS 9100 and ISO 14 001 manages its modern manufacturing processes.
Moreover, it holds Design Organisation Approval (DOA) and Production Organization Approval (POA) for aerospace products according to Part 21, Section A, Subpart J, G.
PBS' production plants are located in the Czech Republic, a member of the European Union.

## Facts & Figures

- Year-on-year growth in sales
- Approximately 800 qualified employees
- Sales representatives in the USA, UK, China and Russia
- Export to over 30 countries around the world
- More than 7,000 aircraft engines, APUs and ECS sold
- 200 years of brand tradition
- 50 years experience in aerospace technology




VB10A
VB10A

# ENGINES

PBS has designed and successfully launched on the market a series of high-quality, reliable light turbine engines, used mainly in smaller and experimental aircraft, helicopters, UAVs and target drones.
Due to their high-level parameters, our engines hold a major advantage with their lightweight structure and weight-to-power ratio ranking them among world leaders in their field.

## Products

- TP100
- TS100
- TJ100
- TJ80
- TJ40
- TJ20

# TP100

## TURBOPROP ENGINE

is designed for experimental aircraft,
and UAV systems

## Main features

- Excellent power-to-weight ratio
- Installation in pusher or tractor mode
- Gearbox design offers the possibility to install an alternator with output power 1.6 kW
- Modular design features a gas generator, power turbine and gearbox
- Standard completion: fuel-oil system, control system, ignition unit and connection cables
- Small installation dimensions, low weight and high static power

The TP100 is a turboprop engine especially suited to small aircraft and unmanned aerial vehicles. The main advantage of this engine is its low weight with a power of 180 kW and its capacity to achieve flight levels of 9,000 m with a maximum starting height of 6,000 m.
The system is designed so that the engine can be placed in the aircraft in either pusher or tractor mode.

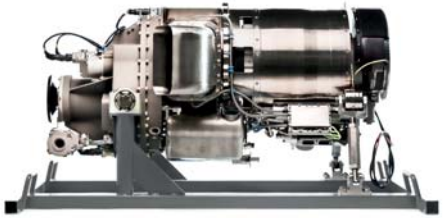
## Technical parameters

| Technical parameters | | |
|---|---|---|
| Output shaft speed | 2,158 RPM | 2,158 RPM |
| Gas generator speed (100%) | 56,200 RPM | 56,200 RPM |
| Power supply | 28 V DC | 28 V DC |
| Electrical power output | 720 W | 720 W |
| **Dimensions and weight** | | |
| Height x width (without exhaust) | 398 × 330 mm | 15.67 × 13.00 in |
| Length | 891 mm | 35.08 in |
| Engine weight | 61.6 kg | 135.8 lbs |
| **Power** | | |
| Take-off (max. 5 min.) | 180 kW | 241 HP |
| Maximum continuous | 160 kW | 214 HP |
| Normal cruise | 140 kW | 188 HP |
| **Fuel consumption (SFC)** | | |
| Take-off (max. 5 min.) | 0.515 kg/kW/h | 0.847 lb/HP/hr |
| Maximum continuous | 0.525 kg/kW/h | 0.863 lb/HP/hr |
| Normal cruise | 0.548 kg/kW/h | 0.901 lb/HP/hr |
| **Other data** | | |
| Max. EGT | 650°C | 1,202°F |
| Amount of air intake | 1.5 kg/sec | 3.3 lb/sec |
| Fuel | JET A, A1, B of DERD 2494 standard<br>TS-1, T2, RT of GOST 10227-86 standard | |
| Oil | according to MIL-L-23699<br>( Mobil Jet oil II, AEROSHELL 390) | |
| **Operating range** | | |
| Max. operating altitude | 9,000 m | 29,500 ft |
| Max. starting altitude | 6,000 m | 19,700 ft |
| Temperature operating range (0 m) | -50°C to ISA+30°C | -58°F to ISA+54°F |
| Ambient temperature for start (0 m) | -30°C to ISA+30°C | -22°F to ISA+54°F |

# TS100

## TURBOSHAFT ENGINE

is designed for small helicopter
applications and UAV systems



## Main features

- Modular design features a gas generator, power turbine and gearbox
- Gearbox design offers the possibility to install an alternator with output power 1.6 kW
- Two engine versions: 2,158 rpm or 5,978 rpm (output shaft speed)
- Compact dimensions, low weight and high static power
- Excellent power-to-weight ratio
- Standard completion: fuel-oil system, control system, ignition unit and connection cables

The TS100 is a turboshaft engine. The engine is suitable for small and light helicopters or for unmanned aerial vehicles.
The advantage of the engine lies in its small installation dimensions, low weight and high static performance at 180 kW with the capacity to achieve flight levels of up to 9,000 m and a maximum starting height of 6,000 m.

## Technical parameters

| Technical parameters | | |
|---|---|---|
| Output shaft speed TS100ZA/TS100DA | 5,978 RPM/2,158 RPM | 5,978 RPM/2,158 PM |
| Gas generator speed (100%) | 56,200 RPM | 56,200 RPM |
| Power supply | 28 V DC | 28 V DC |
| Electrical power output | 720 W | 720 W |
| **Dimensions and weight** | | |
| Height x width (without exhaust) | 398 × 330 mm | 15.67 × 13.00 in |
| Length TS100ZA/TS100DA | 829 mm/881 mm | 34.64 in/34.69 in |
| Engine weight TS100ZA/TS100DA | 56.7 kg/61.3 kg | 125 lbs/135 lbs |
| **Power** | | |
| Take-off (max. 5 min.) | 180 kW | 241 HP |
| Maximum continuous | 160 kW | 214 HP |
| Normal cruise | 140 kW | 188 HP |
| **Fuel consumption (SFC)** | | |
| Take-off (max. 5 min.) | 0.515 kg/kW/h | 0.847 lb/HP/hr |
| Maximum continuous | 0.525 kg/kW/h | 0.863 lb/HP/hr |
| Normal cruise | 0.548 kg/kW/h | 0.901 lb/HP/hr |
| **Other data** | | |
| Max. EGT | 650°C | 1,202°F |
| Amount of air intake | 1.5 kg/sec | 3.3 lb/sec |
| Fuel | JET A, A1, B of DERD 2494 standard<br>TS-1, T2, RT of GOST 10227-86 standard | |
| Oil | according to MIL-L-23699<br>( Mobil Jet oil II, AEROSHELL 390) | |
| **Operating range** | | |
| Max. operating altitude | 9,000 m | 29,500 ft |
| Max. starting altitude | 6,000 m | 19,700 ft |
| Temperature operating range | -50°C to ISA+30°C | -58°F to ISA+54°F |
| Ambient temperature for start | -30°C to ISA+30°C | -22°F to ISA+54°F |

# TJ100

## TURBOJET ENGINE

is designed for UAV and UCAV systems,
target drones, powered gliders and microjets

## Main features

- Compact design, excellent thrust-to-weight ratio and low fuel consumption for its category
- The integrated starter-generator supplies electricity to the vehicle's onboard wiring and cools the engine after shutdown
- Classic design – radial compressor and annular combustion chamber, axial turbine and fixed output nozzle
- Standard equipment fuel-oil system, control system, ignition unit, connection cables and manual or fully automatic control
- Many optional accessories to suit aircraft installation

The TJ100 is especially suitable for unmaned aerial vehicles, target drones, missiles and powered gliders.
The TJ100 engine is of a compact design and has an excellent power-to-weight ratio of up to 1,300 N with low fuel consumption for its output category. This engine is also suitable for water landing.

## Technical parameters

| Technical parameters | | |
|---|---|---|
| Thrust: take-off (max. 5 min.) | 1,300 N | 292 lbf |
| Power supply | 28 V DC | 28 V DC |
| Electrical output power | 750 W | 750 W |
| Specific fuel consumption at max. thrust | ≤ 0.112 kg/N/h | ≤ 1.0983 lb/lbf/hr |
| **Dimensions and weight** | | |
| Outside diameter | 272 mm | 10.7 in |
| Engine length | 625 mm | 24.6 in |
| Engine weight | 19.5 kg | 43 lb |
| **Other data** | | |
| Max. EGT | 820°C | 1,508°F |
| Amount of air intake | 1.7 kg/sec | 3.75 lb/sec |
| Revolutions max. | 60,000 RPM | 60,000 RPM |
| Fuel | JET A, A1, B of DERD 2494 standard<br>TS-1, T2, RT of GOST 10227-86 standard | |
| Oil | according to MIL-L-23699<br>(Mobil Jet oil II, AEROSHELL 560) | |
| **Operating range** | | |
| Max. operating altitude | 10,000 m | 32,800 ft |
| Max. starting altitude | 8,000 m | 26,200 ft |
| Flight speed range | < Mach 0.8 | < Mach 0.8 |
| Speed range for startup | < Mach 0.6 | < Mach 0.6 |
| Temperature operating range | -40°C to +50°C | -40°F to +122°F |

# TJ80

## TURBOJET ENGINE

is designed for missiles, target drones and UAVs

## Main features

- Compact design
- Excellent thrust-to-weight ratio and low fuel consumption for its power category
- Uniform fuel for the engine and for lubrication, maintenance-free operation
- Electrical starting
- Integrated starter-generator incl. inverter
- Easy engine start at temperatures as low as -40°C, at speed up to 0.6 M, to altitude to 6,000 m
- Repeat start on the ground and in flight
- Any engine position at the time of launch
- Shortened start-up sequence below 30 sec

The TJ80 is a turbojet engine designed for missiles, target drones and UAV systems. It has the advantage of having a weight of only 12.5 kg incl. accessories and a thrust of 800 N.

## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Max. thrust (5 min.) | 900 N | 202 lbf |
| Thrust (continuous) | 800 N | 180 lbf |
| Specific fuel consumption (SFC) | 0.122 kg/N/h | 1.18 lb/lbf/hr |
| RPM | 58,000 RPM | 58,000 RPM |
| Airflow | 1.47 kg/sec | 3.24 lb/sec |
| Compression ratio | 4.7 | 4.7 |

### Dimensions and weight

| | | |
|---|---|---|
| Outside diameter | 235 mm | 9.25 in |
| Engine length | 514 mm | 20.24 in |
| Engine weight | 10.5 kg | 23.1 lb |
| Engine weight accessories | 2.0 kg | 4.4 lb |

### Operation conditions

| | | |
|---|---|---|
| **Flight envelope** | | |
| Altitude | 10,000 m | 32,808 ft |
| Ambient temperature | -60°C ÷ +50°C | -76 °F ÷ +122 °F |
| Speed | < Mach 0.8 | < Mach 0.8 |
| **Starting envelope** | | |
| Altitude | 6,000 m | 19,685 ft |
| Ambient temperature | -40°C ÷ +50°C | -40 °F ÷ +122 °F |
| Speed | < Mach 0.6 | < Mach 0.6 |
| Fuel | JET-A1, TS-1, RT | |
| Lubrication | 2-3% oil in fuel<br>(oil must meet standard MIL-L-Z3 699) | |

### Additional data

| | | |
|---|---|---|
| Electric generator power | 28 V–1,000 W | 28 V–1,000 W |
| Engine starting | BLDC starter | |
| Standard accessories | Engine control unit (ECU), Exciter ignition, Electromagnetic stop valve | |

# TJ40

## TURBOJET ENGINE

is designed for UAV systems
and powered gliders



## Main features

- Compact design – all accessories integrated within the engine body (excl. fuel pump)
- Excellent thrust-to-weight ratio and low fuel consumption for its power category
- Kerosene starting
- Integrated starter-generator
- Easy engine start at temperatures as low as -40°C, at speed up to 0.35 M, to altitude to 4,500 m
- Repeat start on the ground and in flight
- Any engine position at the time of launch
- Shortened start-up sequence below 30 sec

The TJ40 is a turbojet engine designed for UAV systems, such as target drones, decoy drones, or small reconnaissance drones.
It has the advantage of having a weight of only 3.3 kg and a thrust of 395 N.

## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Thrust: take - off (max. 5 min.) | 395 N | 88.8 lbf |
| Power supply | 13.8 V DC | 13.8 V DC |
| Electrical power output | 200 W | 200 W |
| Specific fuel consumption at max. thrust | ≤ 0,147 kg/N/h | ≤ 1.44 lb/lbf/hr |
| Fuel consumption min. - idle | 200 ml/min | 6.76 fl oz/min |
| Fuel consumption - max. thrust | 1,210 ml/min | 40.91 fl oz/min |

### Dimensions and weight

| | | |
|---|---|---|
| Outside diameter | 147 mm | 5.79 in |
| Engine length | 305 mm | 11.97 in |
| Engine weight | 3.30 kg | 7.27 lb |
| Weight of accessories | 200 g | 0.44 lb |

### Other data

| | | |
|---|---|---|
| Max. EGT | 900°C | 1652°F |
| Amount of air intake | 0.74 kg/sec | 1.63 lb/sec |
| Revolutions max. | 98,000 RPM | 98,000 RPM |
| Fuel | JET A-1 or equivalent with 3% turbine oil | |
| Oil | Mobil Jet oil II/AEROSHELL 500/ AEROSHELL 560 | |

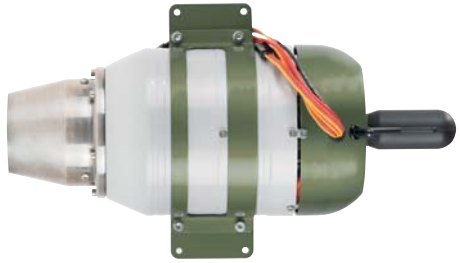
### Operating range

| | | |
|---|---|---|
| Start envelope - altitude | -300 m ÷ 4,500 m | -984 ft ÷ 14,700 ft |
| Start envelope - speed | < Mach 0.35 | < Mach 0.35 |
| Start envelope - temperature | -40°C to +50°C | -40°F to +122°F |
| Start envelope - engine position | arbitrary | arbitrary |
| Start envelope - time to reach idle | ~30 sec | ~30 sec |
| Flight envelope - altitude | 9,000 m | 29,500 ft |
| Flight envelope - speed | < Mach 0.8 | < Mach 0.8 |
| Flight envelope - temperature | -50°C to ÷ 50°C | -58°F ÷ 122°F |

# TJ20U

## TURBOJET ENGINE

is designed for target drones or decoy drones



## Main features

- A complete range of accessories including electronics, pump, electric valves, spark plug and engine-integrated sensors
- Electric starting system, one fuel supply and constant engine thrust, independent of ambient temperature
- Operates efficiently with battery connection (3 sLiPo – 2,200 mAh) and with a fuel mixture supply containing 3% turbine oil
- Accessories: fuel filter, D6.5 hose, fixing clamp, flange and EDT
- Kerosene starting
- Easy and rapid start-up

The TJ20U is a small turbojet engine designed for UAV systems, such as target drones and decoy drones and small reconnaissance drones. It has the advantage of having a weight of only 1.98 kg and a thrust of 230 N.
It comes with electric starting, a fuel pump and a sparkplug built into the casing of the combustion chamber – the ideal components for UAV systems.

## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Thrust: take-off (max. 5 min.) | 230 N | 51,706 lbf |
| Power supply | 12 V DC | 12 V DC |
| Electrical power output | | |
| Specific fuel consumption at max. thrust | ≤ 0.165 kg/N/h | ≤ 1.6181 lb/lbf/hr |
| Fuel consumption min. - idle | 126 ml/min | 4.26 fl oz/min |
| Fuel consumption - max. thrust | 650 ml/min | 21.98 fl oz/min |

### Dimensions and weight

| | | |
|---|---|---|
| Outside diameter | 121 mm | 4.76 in |
| Engine length | 316 mm | 12.44 in |
| Engine weight | 1.98 kg | 4.37 lb |
| Weight of accessories | 230 g | 0.51 lb |

### Other data

| | | |
|---|---|---|
| Max. EGT | 830°C | 1526°F |
| Amount of air intake | 0.4 kg/sec | 0.882 lb/sec |
| Revolutions max. | 122,000 RPM | 122,000 RPM |
| Fuel | JET A-1 or equivalent with 3% turbine oil | |
| Oil | Mobil Jet oil II/AEROSHELL 500/ AEROSHELL 560 | |

### Operating range

| | | |
|---|---|---|
| Max. operating altitude | 6,000 m | 19,700 ft |
| Flight speed range | < Mach 0.6 | < Mach 0.6 |
| Temperature operating range | -20°C to +50°C | -4°F to +122°F |

# AUXILIARY POWER UNITS

PBS Velka Bites is a designer and manufacturer of Auxiliary Power Units designed especially for airplanes and helicopters serving in the defense and civilian industries. These products are manufactured according to specific customer requirements.
Auxiliary Power Units are used for starting the main engines or for supplying onboard devices and air conditioning units.

## Products

- SAFIR 5K/G MI
- SAFIR 5K/G MI40
- SAFIR 5K/G MIS
- SAFIR 5K/G Z8

# SAFIR 5K/G MI

is designed to supply air to engine
starters and environmental control systems

## Main features

- Simultaneous supply of  electric power and compressed air
- Unlimited number of main engine starts
- Continuous operation lasting 6 hours
- High reliability of APU operations
- Supply of bleed air of suitable cleanliness for air-conditioning systems
- Long service life and operation periods
- Simple maintenance
- Ecological fuel drainage
- Starting and operating altitude up to 6,000 m

The APU Safír 5K/G MI is an autonomous power unit designed to supply compressed air for starting the main engines, and to supply AC voltage to the aircraft on-board network. Compressed air can be also taken in by the aircraft environmental control systems. Furthermore, the APU enables connection of other accessories (e.g. hydraulic pump).
The APU includes all accessories necessary for its safe operation and monitoring both immediate and long-time condition of the unit. Exhaust gas temperature, speed and other parameters are monitored continuously.
The state of fuel and oil filter clogging and low oil level are also signalled.
All data is recorded by the control unit equipped with an RS 422 communication interface.
The APU Safír 5K/G MI has been certified for civil aviation by AR MAK according to AP VD and by CCA CZ according to TSO-C77b (recognized by EASA).

## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Nominal power output | 20 kVA | 20 kVA |
| Electrical power supply | 3× 115 V/200 V/400 Hz | 3× 115V/200 V/400 Hz |
| Bleed air extraction max. | 28.3 kg/min | 62.4 lb/min |
| Fuel consumption | max. 55 kg/hour | max. 121 lb/hour |
| Temperature operating range | -55°C to +60°C | -67°F to +140°F |
| Max. operating altitude | 6,000 m | 19,700 ft |

### Dimensions and weight

| | | |
|---|---|---|
| Length (with AC generator) | 788 mm | 31.0 in |
| Width × Depth | 520 × 491 mm | 20.5 × 19.3 in |
| Weight (with AC generator) | 64 kg | 141 lb |

# SAFIR 5K/G MI40

is designed for starting the main engines
using air pressure

## Main features

- Simultaneous supply of  electric power and compressed air
- Unlimited number of main engine starts
- Continuous operation lasting 6 hours
- High reliability of APU operations
- Supply of bleed air of suitable cleanliness for air-conditioning systems
- Long service life and operation periods
- Simple maintenance
- Ecological fuel drainage
- Starting and operating altitude up to 6,000 m

The APU Safír 5K/G MI 40 is an autonomous power unit designed to supply compressed air for starting the main engines, and to supply AC voltage to the aircraft on-board network. Compressed air can be also taken in by the aircraft environmental control systems. Furthermore, the APU enables connection of other accessories (e.g. hydraulic pump). The APU includes all accessories necessary for its safe operation and monitoring both immediate and long-time condition of the unit.
Exhaust gas temperature, speed and other parameters are monitored continuously. The state of fuel and oil filter clogging and low oil level are also signalled.
All data is recorded by the control unit equipped with an RS 422 communication interface.

## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Nominal power output | 40 kVA | 40 kVA |
| Electrical power supply | 3× 115 V/200 V/400 Hz | 3× 115V/200 V/400 Hz |
| Bleed air extraction max. | 28.3 kg/min | 62.4 lb/min |
| Fuel consumption | max. 55 kg/hour | max. 121 lb/hour |
| Temperature operating range | -55°C to +60°C | -67°F to +140°F |
| Max. operating altitude | 6,000 m | 19,700 ft |

### Dimensions and weight

| | | |
|---|---|---|
| Length (with AC generator) | 820 mm | 32.3 in |
| Width × Depth | 398 × 520 mm | 15.7 × 20.5 in |
| Weight (with AC generator) | 68 kg | 150 lb |

# SAFIR 5K/G MIS

is designed for starting the main engines
using compressed air

## Main features

- Unlimited number of air take-offs for starting engines
- Continuous operation lasting 6 hours
- High reliability of APU operations
- Long service life
- Simple maintenance
- Ecological fuel drainage
- Optimized signalization for decreasing strain on the flight crew
- TBO 1,500 hours
- 3,000 APU starts
- Start and operation altitude  up to 6,000 m

The APU Safír 5K/G MIS is an autonomous power unit designed to supply compressed air for starting the main engines, and to supply DC voltage to the aircraft on-board network. Compressed air can be also taken in by the aircraft environmental control systems. Furthermore, the APU enables connection of other accessories (e.g. hydraulic pump).
The APU includes all accessories necessary for its safe operation and monitoring both immediate and long-time condition of the unit.
Exhaust gas temperature, speed and other parameters are monitored continuously. The state of fuel and oil filter clogging are also signalled.
All data is recorded by the control unit equipped with an RS 422 communication interface.
The APU Safír 5K/G MIS has been certified for civil aviation by AR MAK according to AP VD and by EASA according to TSO-C77b.

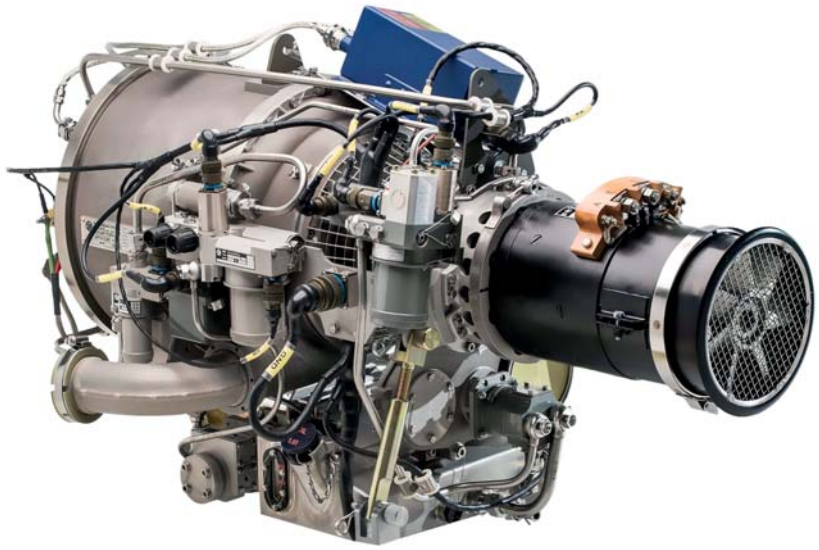
## Technical parameters

### Technical parameters

| | | |
|---|---|---|
| Nominal power output | 6 kW | 6 kW |
| Nominal output current | 200 A | 200 A |
| Electrical power supply | 28 V DC | 28 V DC |
| Bleed air extraction max. | 28.3 kg/min | 62.4 lb/min |
| Fuel consumption | max. 55 kg/hour | max. 121 lb/hour |
| Max. operating altitude | -55°C to +60°C | -67°F to +140°F |
| Temperature operating range | 6,000 m | 19,700 ft |

### Dimensions and weight

| | | |
|---|---|---|
| Length (with DC starter - generator) | 819 mm | 32.2 in |
| Width × Depth (included air bleed system) | 468 × 524 mm | 18.4 × 20.6 in |
| Weight (with DC starter - generator) | 57 kg | 125,6 lb |



# SAFIR 5K/G Z8

is designed for main engine electrical starting
and electrical power supply

## Main features

- Continuous operation lasting 6 hours
- High reliability of APU operations
- Long service life and operation periods
- Simple maintenance
- Ecological fuel drainage
- Optimized signalization for decreasing strain on the flight crew

The APU Safír 5K/G Z8 is an autonomous power unit designed to supply AC voltage for starting the main engines and for the on-board network. Furthermore, the APU enables connection of other accessories (e.g. hydraulic pump).
The APU includes all accessories (without AC generator) necessary for its safe operation and monitoring both immediate and long-time condition of the unit. Exhaust gas temperature, speed and other parameters are monitored continuously. The state of fuel and oil filter clogging are also signalled.
All data is recorded by the control unit equipped with an RS 422 communication interface.
The APU Safír 5K/G Z8 has been certified for civil aviation by EASA according to CS-APU and CAAC according to TSO-C77B.

## Technical parameters

| Technical parameters | | |
|---|---|---|
| Nominal power output | 40 kVA | 40 kVA |
| Electrical power supply | 3× 115 V/200 V/400 Hz | 3× 115 V/200 V/400 Hz |
| Fuel consumption | max. 55 kg/hour | max. 121 lb/hour |
| Temperature operating range | -55°C to +60°C | -67°F to +140°F |
| Max. operating altitude | 6,000 m | 19,700 ft |
| **Dimensions and weight** | | |
| Length (without AC generator) | 638 mm | 25,1 in |
| Width × Depth (included air bleed system) | 398 × 520 mm | 15,6 × 20,4 in |
| Weight (without AC generator 21.1 kg) | 48.5 kg | 107 lb |


CZECH AIR FORCE
6063

# ENVIRONMENTAL CONTROL SYSTEMS

PBS Velka Bites is a designer and manufacturer of Environmental Control Systems for aircraft and helicopters. Environmental Control Systems are designed to maintain a comfortable thermal environment in the cockpit, passenger cabin and cargo holds of aircraft and helicopters during ground operations and all flight modes. Every system is tailored to specific aircraft in order to comply with the main aircraft engine source of compressed air for air-conditioning units.

## Products

- ECS-M1V
- ECS-Y12F
- ECS-K8
- ECS L-39, L-59, L-159

## Main components

- Turbocooler
- Heat exchanger
- Water separator
- Control valves
- Shut-off valve
- Check valve
- Thermostats
- Pneumatic regulation

## Main features

- All-in-one cooling and heating
- Low weight, simple installation, compact design
- No electricity requirements
- Long time before overhaul (TBO)
- Ecological operation – no refrigerant
- Simple variability according to customer requirements

# ECS-M1V

Designed for heating, cooling and ventilation of Mi-8/17 family helicopters and the new, advanced Mi-171A2 helicopter.
This ECS also enables independent control of passenger cabin (or cargo area) air-conditioning, including the ability to shut-off air conditioning and control distribution to upper and lower ducts.
In case that air-conditioning system is shut down it is possible to turn on independent electrical fan for supplying ambient fresh air to the cockpit and passenger cabin (or cargo area).

## Technical parameters

| | | |
|---|---|---|
| Inlet bleed air pressure | max. 400 kPa | max. 58 psi |
| Inlet bleed air temperature | max. 210°C | max. 410°F |
| Air flow rate | max. 1,500 kg/hour | max. 3,300 lbs/hour |
| Cooling capacity | max. 10.8 kW | max. 36,900 BTU/hour |
| Heating capacity | max. 62.0 kW | max. 211,800 BTU/hour |
| Air-conditioning temperature range | 0°C to +90°C | +32°F to +194°F |
| Cabin temperature control range | +15°C to +30°C | +59°F to +86°F |
| Operational ambient temperature | -55°C to +60°C | -67°F to +140°F |
| Operational altitude range | 0 to 6,000 m | 0 to 19,700 ft |
| Weight | 60.0 kg | 132.3 lbs |
| Dimensions (length x height x width) | 1,695 × 592 × 466 mm | 66.73 × 23.31 × 18.35 in |
| Lifetime (operating hours) | 12,000 | 12,000 |

# ECS-Y12F

Designed for heating, cooling and ventilation of a light, twin-turboprop Y12F airplane (19 passengers and 2 pilots) for general or regional aviation.

## Technical parameters

| | | |
|---|---|---|
| Inlet bleed air pressure | max. 1,000 kPa | max. 145 psi |
| Inlet bleed air temperature | max. 350°C | max. 662°F |
| Air flow rate | max. 1,000 kg/hour | max. 2,200 lbs/hour |
| Cooling capacity | max. 7.0 kW | max. 23,900 BTU/hour |
| Heating capacity | max. 19.7 kW | max. 67,300 BTU/hour |
| Air-conditioning temperature range | 0°C to +90°C | +32°F to +194°F |
| Cabin temperature control range | +15°C to +30°C | +59°F to +86°F |
| Operational ambient temperature | -50°C to +45°C | -58°F to +113°F |
| Operational altitude range | 0 to 7,000 m | 0 to 23,000 ft |
| Weight | 41.0 kg | 90.4 lbs |
| Dimensions (length x height x width) | 1,029 x 323 x 771 mm | 40.51 × 12.72 × 30.35 in |
| Lifetime (operating hours) | 9,000 | 9,000 |

# ECS-K8

Designed for heating, cooling, ventilation and pressurization of a trainer jet and light attack K-8 airplane.
This ECS enables a “de-fog” function, which removes canopy fogging using hot air.

## Technical parameters

| | | |
|---|---|---|
| Inlet bleed air pressure | max. 1,100 kPa | max. 160 psi |
| Inlet bleed air temperature | max. 350°C | max. 662°F |
| Air flow rate | 540±20 kg/hour | 1,190±44 lbs/hour |
| Cooling capacity | max. 3.3 kW | max. 11,300 BTU/hour |
| Heating capacity | max. 16.8 kW | max. 57,324 BTU/hour |
| Air-conditioning temperature range | 0°C to +93°C | +32°F to +199°F |
| Cabin temperature control range | +12°C to +33°C | +54°F to +91°F |
| Operational ambient temperature | -55°C to +60°C | -67°F to +140°F |
| Operational altitude range | 0 to 11,000 m | 0 to 36,000 ft |
| Weight | 32.5 kg | 71.7 lbs |
| Dimensions (length x height x width) | 1,030 x 203 x 548 mm | 40.55 x 8.00 x 21.57 in |
| Lifetime (operating hours) | 4,500 | 4,500 |

# ECS L-39, L-59, L-159

Designed for heating, cooling, ventilation and pressurization of L-39 and L-59 trainer jets and the L-159 light attack airplane.

## Technical parameters

| | | |
|---|---|---|
| Inlet bleed air pressure | max. 1,400 kPa | max. 203 psi |
| Inlet bleed air temperature | max. 430°C | max. 806°F |
| Air flow rate | max. 600 kg/hour | max. 1,320lbs/hour |
| Cooling capacity | max. 3.3 kW | max. 11,300 BTU/hour |
| Heating capacity | max. 16.8 kW | max. 57,400 BTU/hour |
| Air-conditioning temperature range | 0°C to +130°C | +32°F to +266°F |
| Cabin temperature control range | +12°C to +33°C | +54°F to +91°F |
| Operational ambient temperature | -55°C to +50°C | -67°F to +122°F |
| Operational altitude range | 0 to 12,000 m | 0 to 39,400 ft |
| Weight | separate components | separate components |
| Dimensions (length x height x width) | separate components | separate components |
| Lifetime (operating hours) | max. 8,000 | max. 8,000 |

# GEAR GRINDING

Gear grinding and measuring using the NILES ZE 400 gear profile grinding machine and the KLINGELNBERG P26 gear measuring centre. We grind and measure cylindrical gears with outer involute straight or helical gearing. We ensure complete manufacture of gears and as well as complete gear boxes including testing.


# COATING OF TURBINE BLADES

Coating of bladed components of jet engines and combustion turbines.

- „Out of Pack“ coating method
- Vertical vacuum furnace
- Standard coat thickness

## Grinding machine parameters

| | |
|---|---|
| Module | 0.5 - 12 mm |
| Helix angle of tooth | +/- 45° |
| Outside diameter | max. 260 mm |
| Gearing width | max. 400 mm |
| Workpiece diameter between centres | max. 600 mm |
| Workpiece weight | max. 30 kg |
| Modification | both height and length |
| Degree of accuracy | 3 - 4 according to DIN 3962 |

## Coating furnace parameters

| | |
|---|---|
| Working space Ø | 400 mm (height) |
| Standard coat thickness | 40 µm–70 µm |
| Deposition temperature | > 1,000°C |
| Maximum usable coating temperature | 1,100°C |
| Coated material | INC713LC |

# HEAT TREATMENT IN VACUUM

Brazing in vacuum and vacuum heat treatment in a protective atmosphere of nitrogen and argon. These tasks are carried out using the SECO/WARWICK 15.0VPT-4025 vacuum furnace.

## Vacuum furnace parameters

| | |
|---|---|
| Working space (w x d x h) | 600 × 600 × 400 mm |
| Maximum weight of charge | 400 kg |
| Maximum working temperature | 1,300°C |
| Maximum variation of temperature field | +/- 6°C |
| Workpiece diameter between centres | max. 600 mm |
| Working vacuum | $10^{-4}$ |
| Maximum working overpressure | Ar = 9 bar, N2 = 14 bar |

# PRECISION CNC MACHINING

We machine all structural steels including corrosion resistant and tool steels using Hermle and Fehlmann 5-axis CNC machining centres featuring contouring control and high precision (IT5). Furthermore, we can process any alloy of aluminium, titanium, and other metals. Maximum weight of the part is 30 kg.

## CNC machining centres

| Machine name | No. of axes | Machine working space |
|---|---|---|
| Hermle C42 U | 5 | Ø 800 × 550 |
| Hermle C 32 U | 5 | Ø 650 × 500 |
| Hermle C 20 U | 5 | Ø 600 × 450 |
| Fehlmann Picomax 90-M | 5 | Ø 200 × 200 |
| Fehlmann Picomax 60 | 5 | Ø 160 × 200 |


# OUR **CAPABILITIES**

## Aerospace technology testing

- 16 test cells
- Vibration test system TIRA

## Surface treatment

- Anodizing coating of aluminium and its alloys

## Precision castings

- In-house precision casting of turbine engine wheels

## Engine design

- Customization according to customer requirements

## Research & Development

- Design studies, analysis and optimization of aerospace technology

## NDT

- Radiography, FPI, Magnetic particle testing

## Gear grinding

- Grinding and measuring of cylindrical gears with outer involute straight or helical gearing

## Brazing in vacuum

- Heat treatment and brazing with nickel solders in vacuum, in nitrogen and argon atmosphere

## Coating of turbine blades

- Coating of the flow parts of jet engine turbines using the method „Out of Pack“

PBS Velka Bites
SINCE 1814

## Contact us

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